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CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES, UNITED STATES STEEL CORPORATION, DUQUESNE PLANT, PITTSBURGH, PENNSYLVANIA, FEBRUARY 26 - MARCH 6, 1976

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The United States Steel Corporation (USSC) National-Duquesne Works is composed of two separate plants, the National Plant and the Duquesne Plant on the east and west banks, respectively, of the Monongahela River. The plants are about 8 km (13 mi) upstream of the confluence of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania. The Duquesne Plant is primarily an iron and steel production facility with some finishing operations. Ancillary facilities include an oxygen plant, granulated slag operation and water treatment plant. Wastwater is discharged through seven major outfalls (011, 012, 013, 014, 015, 016 and 017) and four intermediate outfalls (111, 211, 112 and 114) (Figs. 1, 2). All wastewaters are discharged untreated with the exception of process wastes from the blast furnaces, BOF, primary mills and bar mill. Blast furnace and BOF process wastewaters are treated for solids removal by gravity thickening and vacuum filtration of sludge. Scale pits are installed for the removal of mill scale from primary and bar mill wastewaters. U.S. EPA Region III, Philadelphia, Pennsylvania, requested the National Enforcement Investigations Center (NEIC) to conduct an intensive survey of wastewater discharges to the Monongahela River from U.S. Steel Corporation facilities.

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CHARACTERIZATION AND EVALUATION OF WASTEWATER SOURCES UNITED STATES STEEL CORPORATION

DUQUESNE PLANT
PITTSBURGH, PENNSYLVANIA

February 26 - March 6, 1976

May 1976

National Enforcement Investigations Center - Denver, Colorado
and
Region III - Philadelphia, Pennsylvania

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I. INTRODUCTION

The United States Steel Corporation (USSC) National-Duquesne Works is composed of two separate plants, the National Plant and the Duquesne Plant on the east and west banks, respectively, of the Monongahela River. The plants are about 8 km (13 mi) upstream of the confluence of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania. The Duquesne Plant is primarily an iron and steel production facility with some finishing operations. Steel-making began at Duquesne about 1886 with the construction of a small Bessemer converter shop and a blooming mill. Since then the plant has been expanded and updated with the latest addition being the No. 6 blast furnace in 1963. The plant became part of the U. S. Steel Corporation in 1901. Present major operations include blast furnaces producing basic iron; basic oxygen furnaces (BOF) and an electric furnace complex manufacturing steel; 21-inch,* 36-inch* and 46-inch* hot rolling mills which manufacture slabs, blooms, billets and rounds; No. 5 bar mill which manufactures bars and rounds; and special heat treating and steel conditioning facilities. Ancillary facilities include an oxygen plant, granulated slag operation and water treatment plant [Figs. 1, 2].

Production capacity at Duquesne as reported by USSC officials is 6,979 m. tons (7,697 tons)/day basic iron, 7,000 m. tons (7,700 tons)/day BOF steel, 727 m. tons (800 tons)/day electric furnace steel and 4,780 m. tons (5,258 tons)/day of hot formed and rolled primary and finished steel, mostly billets, bars and rounds. Industrial water is pumped from the Monongahela River through a single intake located upstream of all wastewater outfalls. Total average water usage is reported as approximately

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* *Metric equivalents: 53.3-, 91.4-, 116.8-cm*

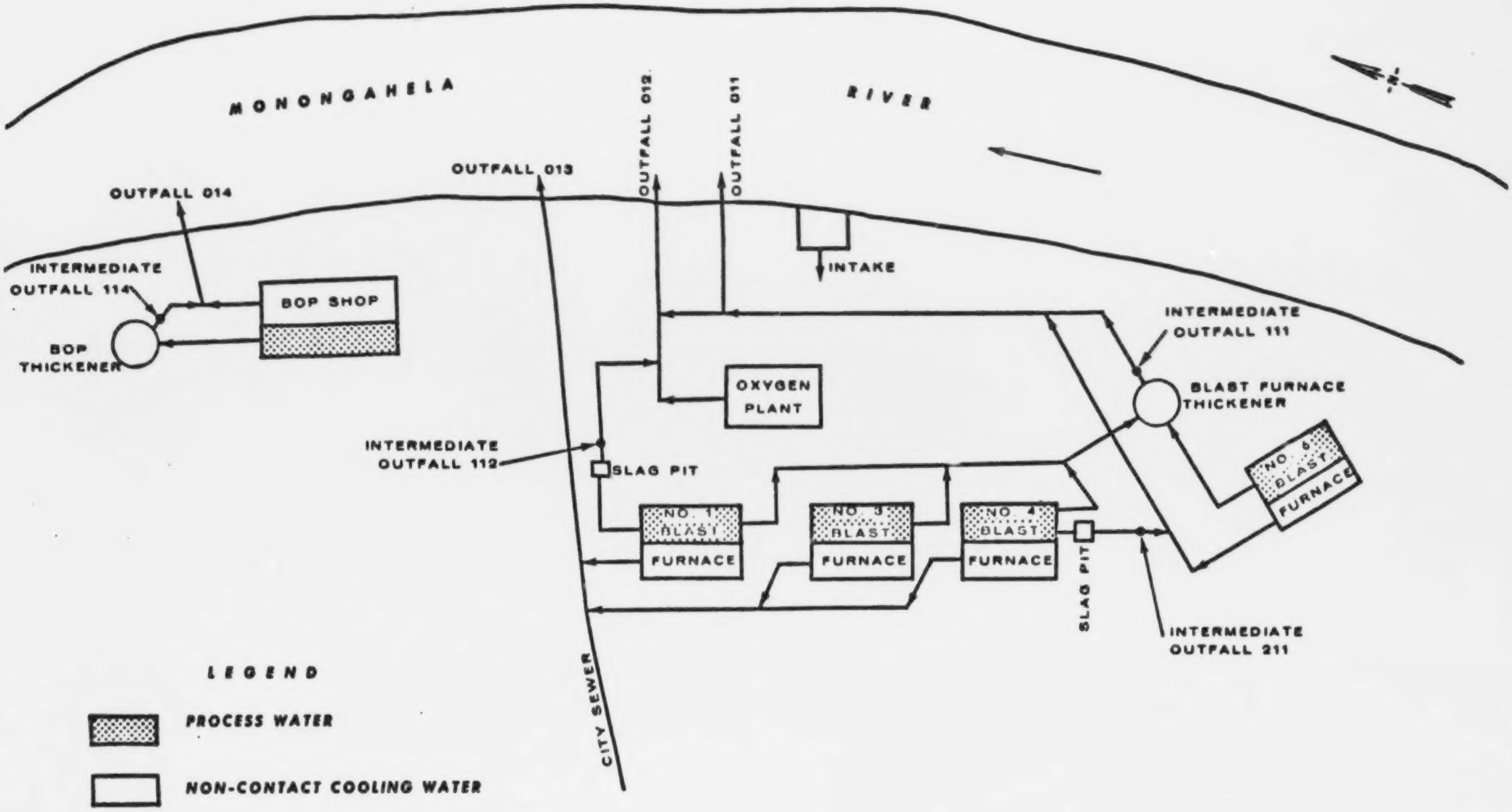
MONONGAHELA RIVER
OUTFALL 014
INTERMEDIATE OUTFALL 114
BOP THICKENER
BOP SHOP
OUTFALL 013
OUTFALL 012
OUTFALL 011
INTAKE
OXYGEN PLANT
INTERMEDIATE OUTFALL 112
SLAG PIT
NO. 1 BLAST FURNACE
NO. 3 BLAST FURNACE
NO. 4 BLAST FURNACE
SLAG PIT
INTERMEDIATE OUTFALL 211
INTERMEDIATE OUTFALL 111
BLAST FURNACE THICKENER
NO. 6 BLAST FURNACE
CITY SEWER
LEGEND
PROCESS WATER
NON-CONTACT COOLING WATER

Figure 1. Plant Layout and Schematic Flow Diagram - USSC Duquesne Plant- Iron and Steel Area

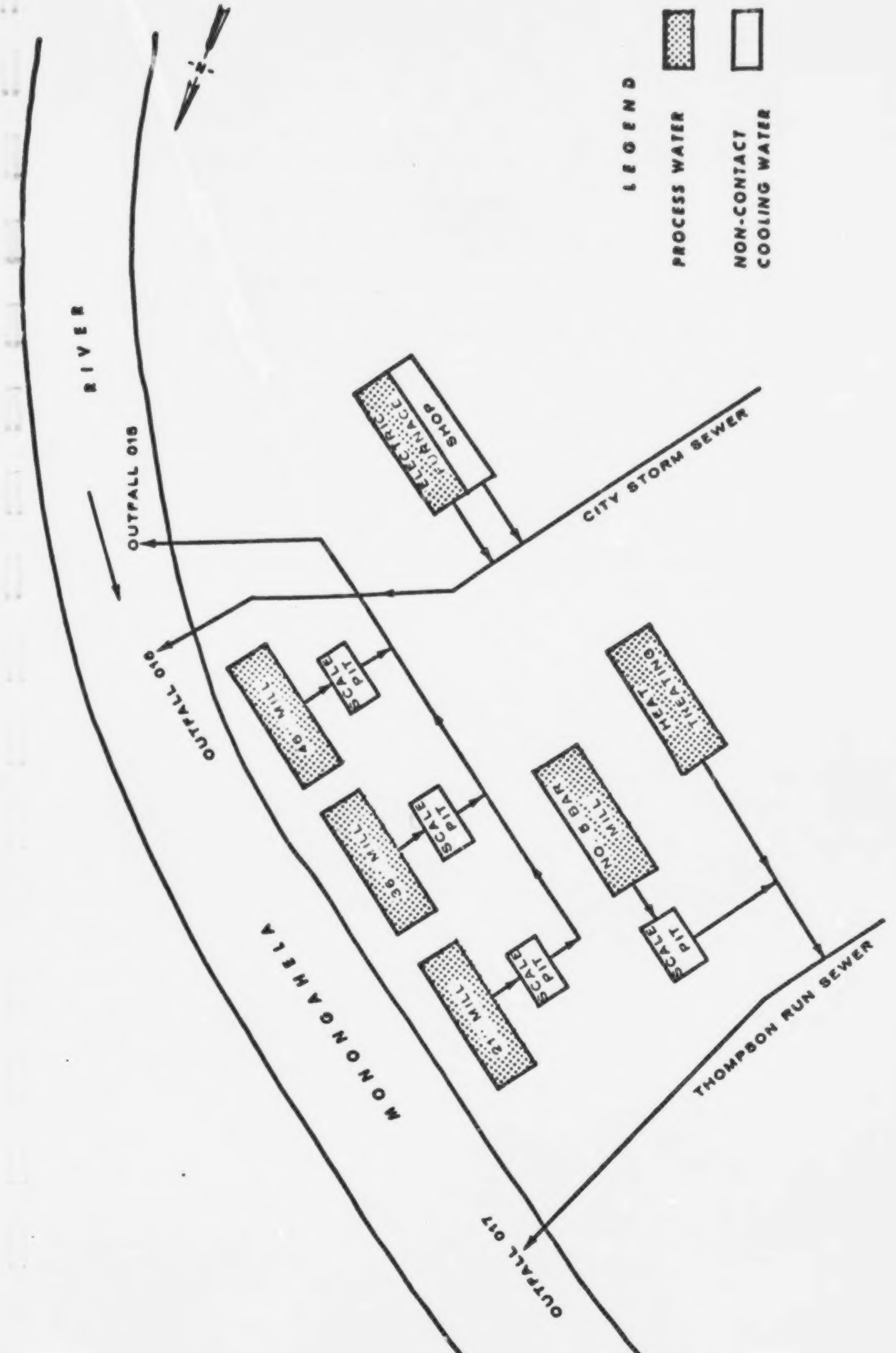
N
LEGEND
PROCESS WATER
NON-CONTACT COOLING WATER
MONONGAHELA RIVER
OUTFALL 015
OUTFALL 016
OUTFALL 017
CITY STORM SEWER
THOMPSON RUN SEWER
ELECTRIC FURNACE SHOP
40" MILL
36" MILL
21" MILL
SCALE PIT
SCALE PIT
SCALE PIT
SCALE PIT
NO. 5 BAR MILL
HEAT TREATING

Figure 2. Plant Layout and Schematic Flow Diagram - USSC Duquesne Plant - Finishing Area

424,000 m^3/day (112 mgd).[1] Wastewater is discharged through seven major outfalls* (011, 012, 013, 014, 015, 016 and 017) and four intermediate outfalls (111, 211, 112 and 114) [Figs. 1, 2]. All wastewaters are discharged untreated with the exception of process wastes from the blast furnaces, BOF, primary mills and bar mill. Blast furnace and BOF process wastewaters are treated for solids removal by gravity thickening and vacuum filtration of sludge. Scale pits are installed for the removal of mill scale from primary and bar mill wastewaters.

U. S. EPA Region III, Philadelphia, Pennsylvania, requested the National Enforcement Investigations Center (NEIC) to conduct an intensive survey of wastewater discharges to the Monongahela River from U.S. Steel Corporation facilities. Treatment facilities and wastewater discharges were evaluated at the USSC Duquesne Plant during February 23-March 6, 1976. All outfalls were monitored for three consecutive days: outfalls 015, 016 and 017 from February 26-29 and outfalls 011, 111, 211, 012, 013, 014 and 114 from March 3-6. Outfall 112 was not active during the investigation.

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* *Outfall numbers refer to National Pollutant Discharge Elimination System (NPDES) permit outfall numbers.*

II. SUMMARY

1. Wastewater discharges and treatment facilities at USSC Duquesne were monitored for three consecutive days during February 26-March 6, 1976. Outfalls 015, 016 and 017 and the primary mill scale pits were evaluated from February 26-29. Outfalls 111, 211, 011, 012, 013, 114 and 014 were monitored along with the blast furnace thickener and the basic oxygen process (BOP) thickener from March 3-6. Treatment facility evaluations included influent and effluent sampling to determine removal efficiencies. The raw water intake was monitored from February 26-29 and March 3-6. Outfall flows were measured using the dye dilution technique. Batch discharges to outfall 013 from the USSC water treatment plant and the City of Duquesne discharge to outfall 016 were estimated. Twenty-four-hour flow-weighted composite samples were collected from all sampling points except the water intake, BOP thickener influent, and water treatment plant batch discharges where samples were equal-volume composited.

2. During the survey, production was approximately 76% of overall plant capacity. Major plant operations were producing the following percent of their rated capacity.

Blast furnaces	61%
Basic oxygen furnaces	78%
Electric furnaces	93%
Primary mill	87%
No. 5 bar mill	127%

All or a portion of each major plant operation discharges wastewater to one or more of the outfalls monitored. Major plant operations associated with each outfall were producing at the following percent of their rated capacity.

Outfall 111	51%
Outfall 211	84%
Outfall 011	73%
Outfall 112	0%
Outfall 012	78%
Outfall 013	36%
Outfall 114	78%
Outfall 014	78%
Outfall 015	87%
Outfall 016	93%
Outfall 017	127%

3. Blast furnace process wastewaters consisting primarily of venturi gas washer flows are treated by gravity thickening and discharged to outfall 111. From March 3-6, 1976, the thickener acccomplished the following average percent removals.

Total suspended solids	97%
Settleable solids	67%
Total iron	97%
Zinc	95%
Oil/grease	73%
Phenolics	55%

Thickener effluent (outfall 111) flow measured by NEIC averaged 24,000 m^3/day (6.4 mgd). The major pollutants discharged were suspended solids, ammonia (NH_3-N), phenolics, cyanide (CN), total iron (Fe) and zinc (Zn). The pH ranged from 5.9 to 7.4. Limitations proposed by USSC are compared with NEIC survey findings:

Parameter	USSC Proposed Limitations†				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	1,412	3,106	4,236	9,318	1,900	4,200	2,600	5,700
NH_3-N	1,054	2,320	3,162	6,960	500	1,100	630	1,400
Phenolics	96	211	288	633	13	29	21	48
CN_T	200	440	600	1,320	150	330	210	470
CN_A	-	-	-	-	86	190	130	290
Fe	-	-	-	-	180	390	230	500
Zn	-	-	-	-	140	300	180	390

† *Proposed limitations are net values except TSS which is gross value*

NEIC survey results are within the range of USSC self-monitoring data for January-October 1975.

4. Discharge from the blast furnace No. 4 granulated slag pit (outfall 211) averaged 16,000 m^3/day (4.3 mgd) and the pH ranged from 5.2 to 7.3. Major pollutants discharged were suspended solids and ammonia. USSC proposed limitations are compared with NEIC survey results:

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS†	3,459	7,610	10,377	22,830	3,500	7,700	6,200	14,000
NH_3-N††	-	-	-	-	32	70	47	100

† *Gross values*
†† *Net values*

NEIC survey results are within the range of USSC self-monitoring data for the period January-October 1975.

5. Outfalls 111 and 211 discharge along with No. 6 blast furnace cooling water to main outfall 011. The outfall 011 sewer is interconnected with the outfall 012 sewer. The outfall 011 monitoring results are wastewater characteristics upsewer of the interconnection with outfall 012. Flow averaged 190,000 m^3/day (51 mgd), 44% greater than the average flow reported by USSC. Survey findings indicated that the average daily total cyanide and amenable cyanide loads discharged through outfall 011 were 360% and 490% greater, respectively, than the sum of loads from outfalls 111 and 211. The sum of average daily total iron and zinc loads from outfalls 111 and 211 were significantly less than discharged through outfall 011. Average daily total suspended solids and ammonia loads discharged from outfall 011 were 42% and 29% less, respectively, than the sum of loads from outfalls 111 and 211.

Average daily pollutant loads discharged were:

Parameter	kg/day	lb/day
TSS	2,400	5,300
NH_3-N	390	850
CN_T	550	1,200
CN_A	430	930
O/G	0	0
Phenolics	12	27
Fe_T	300	660
Fe_D	15	33
Zn	190	410

The pH ranged from 6.6 to 8.3. USSC has proposed that the pH not be less than 6.0 and that no other parameters be limited.

6. Outfall 012 discharges overflow from the No. 1 blast furnace slag pit (outfall 112) and condenser cooling water from the oxygen plant. In addition, outfall 011 is interconnected to outfall 012 and a portion of 011 wastewater is discharged through outfall 012. NEIC monitoring results for outfall 012 refer to wastewater characteristics upsewer of the interconnection. Flow averaged 150,000 m^3/day (41 mgd), 20% greater than the average flow measured by USSC. Survey findings indicated that suspended solids and oil/grease (O/G) were discharged at the following net average daily rates:

Parameter	mg/l	kg/day	lb/day
TSS	3	440	970
O/G	1	200	300

The pH ranged from 6.7 to 8.3 although USSC self-monitoring data indicates a pH range of 7.3 to 11. USSC has proposed that the pH not be less than 6.0 and that no other limitations be established.

7. Cooling water from No. 1, 3 and 4 blast furnaces is discharged to outfall 013 along with USSC water treatment plant wastewaters. In addition, City of Duquesne wastewaters are discharged through

outfall 013. During the survey, samples of City wastewater indicated the presence of sanitary sewage. City flow averaged 4,400 m^3/day (1.2 mgd) and contained primarily suspended solids, ammonia and oil/grease. A single grab sample of City wastewater was collected March 4, 1976 and analyzed for organic compounds. Results indicated the presence of organic compounds at the following concentrations:

Compound	mg/l
Alkanes, 8 species, C_9 to C_{14}	∿0.060
Alpha terpineol	0.230
Caffeine	0.030
Dibutylphthalate	0.022
Diethylphthalate	0.008
Diisobutylphthalate	0.015
Hexadecanol	0.020
Isoborneol	∿0.020
Octadecanol	0.033
Para-Cresol	0.015
Tetradecanol	0.045

Filter backwash and solids blowdown from the USSC water treatment plant are returned to the receiving water contrary to EPA policy and result in an average daily discharge of 1,030 kg (2,366 lb)/day suspended solids. The net USSC flow averaged 32,000 m^3/day (8.5 mgd). Average daily net pollutant loads from USSC sources are compared with daily loads from City sources for suspended solids, ammonia, oil/grease and total iron.

Parameter	USSC		City	
	kg/day	lb/day	kg/day	lb/day
TSS	3,300	7,300	590	1,300
NH_3-N	†	-	22	48
O/G	30	60	420	910
Fe_T	71	160	8.9	19

† *Discharge load was less than intake load.*

Survey findings were within the range of USSC self-monitoring data. The terminus of outfall 013 was sampled for organics March 4, 1976. Results indicated the presence of a single organic compound, alpha terpineol, at a concentration of 0.030 mg/l. Instantaneous flows measured at the time organic samples were collected indicated that 90% of the alpha terpineol originated in City of Duquesne wastewater.

8. Process wastes from the basic oxygen furnaces (BOF) are treated by gravity thickening and discharged through outfall 114. The thickener accomplished the following average percent removals during March 3-6, 1976:

Total suspended solids	99.1%
Settleable solids	99.8%
Total cyanide	81%
Total iron	98%
Zinc	95%
Fluoride	35%
Oil/grease	15%

Thickener effluent (outfall 114) averaged 8,700 m^3/day (2.3 mgd). Major pollutants discharged were suspended solids, total iron and fluoride. The pH ranged from 10.8 to 11.7. USSC has proposed that outfall 114 be limited for gross total suspended solids, dissolved iron, and pH. Proposed limitations are compared with survey results as follows:

Parameter	USSC Proposed Limitations†				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	4,101	9,022	12,303	27,066	470	1,000	550	1,200
Fe_T	-	-	-	-	88	190	110	230
Fe_D	-	-	7 mg/l		0.16 mg/l		0.35 mg/l	
Fl	-	-	-	-	77	170	92	200
pH	Shall not be less than 6.0				Range 10.8-11.7			

† *Proposed limitations are gross values.*

NEIC survey results are within the range of USSC self-monitoring data for January-October 1975.

9. Cooling water from the BOP shop combines with outfall 114 and is discharged through main outfall 014. Flow averaged 36,000 m^3/day (9.6 mgd), and settleable solids ranged from 8 to 35 ml/l and averaged 18 ml/l. Pollutants of primary significance were suspended solids and total iron. Comparison of pollutant loads from outfalls 114 and 014 indicate that average suspended solids and total iron loads of 1,800 kg (4,000 lb)/day and 50 kg (100 lb)/day, respectively, were present in the cooling water discharged to outfall 014.

Parameter	Outfall 114		Outfall 014	
	kg/day	lb/day	kg/day	lb/day
TSS	190	410	2,000	4,400
Fe_T	75	170	125	270

USSC has proposed that the pH not be less than 6.0. During the survey the pH ranged from 10.0 to 11.4. Limitations have not been proposed by USSC for any other parameters. USSC conducted self-monitoring for flow, temperature and pH. NEIC survey results for these parameters are within the range of USSC self-monitoring data for January-October 1975.

10. Primary mill wastewater is discharged through outfall 015 after passing through individual scale pits associated with the 21-, 36- and 46-inch mills. The three scale pits were evaluated to determine their efficiency in removing settleable solids, suspended solids, total iron, dissolved iron, zinc and oil/grease. Although results indicated insignificant removals, representative samples could not be collected for settleable solids, suspended solids, total iron and zinc. The heavier solids in the scale pit influents were not well mixed but were carried entirely in the bed load of the influent streams. NEIC did not sample the bed load. Dissolved

iron and oil/grease removals were not significant. The pH of effluent from the 21- and 46-inch mill scale pits exceeded 9.0 and ranged from 6.4 to 9.6 and 6.6 to 11.0, respectively.

Total flow through outfall 015 averaged 85,000 m^3/day (22 mgd) and the pH ranged from 7.5 to 10.2. Net suspended solids and oil/grease concentrations both averaged 2 mg/l. USSC has proposed that outfall 015 be limited for suspended solids, oil/grease and pH. Proposed limitations are compared with NEIC survey results.

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	19,100	42,021	57,300	126,063†	160	370	480	1,100††
O/G	1,395	3,070	4,186	9,210†††	200	600	600	1,800
pH	Shall not be less than 6.0				Range 7.5-10.2			

† *Proposed as a net limitation until June 30, 1977 and a gross limitation thereafter.*

†† *NEIC results for TSS are not representative.*

††† *Gross limitation*

Although primary mill production was 87% of its rated capacity, the USSC-proposed limitations greatly exceed survey results. NEIC findings are within the range of USSC self-monitoring data for January-October 1975.

11. USSC discharges electric furnace shop wastewaters to a City of Duquesne sewer terminating in outfall 016. Although City flow was not measured and sampled due to limited access at upsewer location, NEIC personnel estimated the flow at 4,200 m^3/day (1.1 mgd). The total discharge from outfall 016 averaged 25,000 m^3/day (6.6 mgd). The pH ranged from 7.1 to 9.4 and the settleable solids from 0.1 to 0.8 ml/l. USSC-proposed net limitations for outfall 016 are compared with NEIC survey results:

Parameter	USSC Proposed Limitations†				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	693	1,524	2,079	4,572	280	620	630	1,400
pH	Shall not be less than 6.0				Range 7.1-9.4			

† *Proposed limitations are net values.*

The electric furnaces were operating at 93% of rated capacity but average suspended solids loads discharged were only about 40% of the USSC-proposed limitations. NEIC survey results are within the range of USSC self-monitoring data for January-October 1975.

12. The No. 5 bar mill, heat treating operations, and rinse waters from the sulfuric acid pickling operation discharge wastewater to outfall 017. During the survey, flow averaged 31,000 m^3/day (8.2 mgd) and the pH ranged from 7.3 to 9.5. USSC-proposed limitations are compared with NEIC survey results below:

Parameter	USSC Proposed Limitations†				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	3,864	8,500	11,592	25,500	290	660	620	1,400
O/G	300	660	900	1,980	20	60	40	100
Fe_D	-	-	7.0 mg/l		††			
pH	Shall not be less than 6.0				Range 7.3-9.5			

† *The USSC-proposed limitations call for gross values until June 30, 1977 after which TSS and O/G values would be net.*

†† *Daily results showed discharge concentrations less than intake values.*

With the exception of pH and dissolved iron, NEIC survey results were within the range of USSC self-monitoring data for January-October, 1975. Less than 10% of the USSC-proposed limitations for suspended solids, O/G and dissolved iron were discharged during the survey, although bar mill production exceeded its rated capacity.

13. USSC monitoring procedures currently include grab sampling and single, instantaneous flow measurements at all monitoring locations except the intake and outfall 112 where 24-hour composite samples are collected. Because of the widely varying flow, grab sampling and single instantaneous flow measurements are not sufficient to characterize the wastewater quality or determine total daily loads.

It is recommended that continuous flow measurement facilities be installed for all process wastewater outfalls (111, 211, 112 and 114). In addition, the installation of continuous flow measurement facilities at outfall 014 is feasible and necessary. Twenty-four-hour monitoring at outfalls 011, 012, 013, 015, 016 and 017 should include a minimum of eight equally spaced instantaneous flow measurements and eight sample portions collected at equally spaced intervals and composited on a flow proportional basis.

III. EVALUATION PROCEDURES

A reconnaissance inspection of the Duquesne Plant was conducted September 23-27, 1975, to evaluate processing operations, sampling locations, and waste treatment facilities [Appendix A]. Based on reconnaissance findings and information provided by USSC, a survey was conducted to evaluate and characterize wastewater discharges. From February 23-March 6, 1976 wastewater discharges were sampled and treatment facilities evaluated. Dates sampled, sample type, and parameters evaluated are presented in Table 1. All sampling, field measurements and laboratory analyses were conducted using NEIC chain-of-custody procedures [Appendix B].

Intake water flows are measured and recorded by USSC using venturi flow tubes and continuous recording charts. Wastewater flows are periodically measured by USSC using a lithium chloride solution as a tracer. A known concentration of lithium chloride is injected at a known rate for five minutes. Samples are collected downstream of the injection point and the lithium concentration determined. The flow calculated from this information represents an instantaneous flow at the time of sampling. During the survey, NEIC measured flows from all outfalls by the dye dilution method [Appendix C] using Rhodamine WT dye. Dye was continuously injected and flow determinations were made every three hours. The resulting eight flow readings for each 24-hour sampling period were averaged to determine the daily flow.

Additional flow determinations were made during the survey. Wastewater from the City of Duquesne is also discharged from outfalls 013 and 016. City flow to outfall 013 was measured using the dye dilution technique. City flow to outfall 016 was not measured due to limited

Table 1

SAMPLING SUMMARY
USSC DUQUESNE PLANT
February 26-March 6, 1976

Station Description	Date Sampled[†]	Type of Sample	Parameters
Water Intake	Feb. 26-29, Mar. 3-6	24-hr equal-volume composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics**
B.F. thickener influent and effluent (111)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease,* phenols*
No. 4 B.F. granulated slag pit overflow (211)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease,* phenols*
B.F. thickener effluent, No. 4 B.F. granulated slag pit overflow and cooling water from No. 6 B.F.(011)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics**
Discharge from overflow box adjacent to Linde Oxygen Plant (012)	Mar. 3-6	24-hour flow-weighted composite	TSS
		Grab	Settleable solids,[††] oil and grease*
Upsewer flow from City of Duquesne to Outfall 013	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, COD
		Grab	Settleable solids,[††] oil and grease,* phenols*
B.F. No. 4 cooling water and upsewer flow from City of Duquesne (013)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, COD
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics**
Water Treatment Plant - filter backwash to Outfall 013	Mar. 4 & 5	Equal-volume composite over period of discharge (i.e. ~ 30 min.)	TSS, settleable solids
Water Treatment Plant - solids blowdown to Outfall 013	Mar. 4	Equal-volume composite over period of discharge (i.e. ~ 30 min.)	TSS, settleable solids
Rake classifier influent to BOP thickener	Mar. 3-6	24-hr equal-volume composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols*
Gas cooling tower slurry influent to BOP thickener	Mar. 3-6	24-hr equal-volume composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols*

Table 1 (Continued)

SAMPLING SUMMARY

Station Description	Date Sampled[†]	Type of Sample	Parameters
Filtrate influent to BOP Thickener	Mar. 3-6	24-hr equal-volume composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols*
BOP thickener effluent (114)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols*
BOP thickener effluent and BOP cooling water (014)	Mar. 3-6	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics*
21" mill scale pit influent and effluent	Feb. 26-29	24-hr flow-weighted composite	TSS, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease*
36" mill scale pit influent and effluent	Feb. 26-29	24-hr flow-weighted composite	TSS, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease*
46" mill scale pit influent and effluent	Feb. 26-29	24-hr flow-weighted composite	TSS, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease*
Effluents from 21", 36" and 46" primary mill scale pits (015)	Feb. 26-29	24-hr flow-weighted composite	TSS, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease,* organics**
Electric furnace discharges and upsewer flow from City of Duquesne (016)	Feb. 26-29	24-hr flow-weighted composite	TSS, ammonia, total and amenable cyanide, total and dissolved iron, zinc, fluoride
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics**
No. 5 Bar Mill and heat treating discharges (017)	Feb. 26-29	24-hr flow-weighted composite	TSS, total and dissolved iron, zinc
		Grab	Settleable solids,[††] oil and grease,* phenols,* organics**

[†] *For 24-hr composite samples, beginning date is day sampling began. Ending date is day final 24-hr composite samples came off. Sampling day was 6 a.m.-6 a.m.*

[††] *Settleable solids were grab sampled once daily.*

* *Three grab samples were collected per 24-hr sampling day.*

** *A single grab sample for organics was collected from each station during monitoring. Two grab samples were collected from the water intake, one during each 3-day sampling period.*

access upsewer of USSC input. The flows of intermittent batch discharges from the USSC water treatment plant to outfall 013 were estimated based on their frequency and volume.

Samples were manually collected every three hours and composited over each 24-hour period based on instantaneous flows measured concurrently. The 24-hour compositing and flow measurement period was from 6 a.m. to 6 a.m. The water intake and basic oxygen process (BOP) thickener influents were composited on an equal-volume basis. Grab samples for oil/grease and phenols were collected three times per day, while settleable solids were grab sampled once daily. Samples for organic analyses were collected once from each main outfall except outfall 012 and twice from the water intake. Field measurements for pH and temperature were made periodically at each station. All samples for oil/grease, settleable solids and total suspended solids (TSS) were analyzed at the NEIC mobile laboratory at the McKeesport Wastewater Treatment Plant. The remaining analyses [Table 1] were performed at the NEIC laboratories in Denver, Colorado. All samples were analyzed in accordance with NEIC analytical quality control procedures [Appendix D].

Treatment efficiencies of the blast furnace thickener and the BOP thickener were evaluated through concurrent influent and effluent sampling. In addition, the three scale pits at the primary mill, though constructed primarily for scale recovery rather than water pollution control, were evaluated to determine treatment efficiency. Instantaneous flows through each of these facilities were measured during sampling.

IV. FINDINGS OF IN-PLANT MONITORING

Major processing segments of the Duquesne Plant were in operation during the NEIC survey with the exception of the No. 1 and 3 blast furnaces and the slag pit associated with blast furnace No. 1. The plant was producing approximately 76% of its overall capacity. Comparison of individual process production with individual process capacity [Table 2] indicates that overall production was down about 2% from levels during January-November 1975 [Table 3]. Overall plant production capacity is compared below with actual daily production.

Process	Overall Capacity		NEIC Survey Production†		Jan.-Nov. 1975 Avg. Production	
	m.tons	tons	m.tons	tons	m.tons	tons
Blast Furnaces	6,979	7,677	4,257	4,683	6,093	6,702
BOF	7,000	7,700	5,445	5,989	5,184	5,702
Electric Furnaces	727	800	675	742	423	465
Primary Mill	4,041	4,445	3,502	3,852	2,757	3,033
No. 5 Bar Mill	739	813	942	1,036	650	715

† *See reference 4*

Monitoring results are tabulated by sampling location and discussed by individual outfall. Results of organic analyses are discussed under outfalls 013 and 016, the only two discharges in which organic compounds were found.

OUTFALL 111

Gas cleaning operations associated with each of the four blast furnaces generate process wastewaters. USSC has estimated that approximately 5,700 m^3/day (1.5 mgd) of process wastewaters are discharged from

Table 2

COMPARISON OF RATED CAPACITY WITH ACTUAL PRODUCTION DURING NEIC SURVEY
USSC DUQUESNE

Unit	Daily Rated Capacity[†]		Actual Production/day[†]							
			3/3		3/4		3/5		3/6	
	m.tons	tons	m.tons	tons	m.tons	tons	m.tons	tons	m.tons	tons
No. 1 B.F.	1,093	1,202	0	0	0	0	0	0	0	0
No. 3 B.F.	1,247	1,372	0	0	0	0	0	0	0	0
No. 4 B.F.	1,790	1,969	1,459	1,605	1,522	1,674	1,553	1,708	1,477	1,625
No. 6 B.F.	2,849	3,134	2,964	3,260	2,412	2,653	2,805	3,085	2,839	3,123
BOF	7,000	7,700	5,854	6,439	5,076	5,584	5,699	6,269	5,150	5,665
Electric Furnace	727	800	657	723	570	627	705	776	764	840
			2/26		2/27		2/28		2/29	
Primary Mill	4,041	4,445	3,276	3,604	3,166	3,483	3,251	3,576	4,315	4,747
No. 5 Bar Mill	739	813	1,165	1,281	720	792	0	0	0	0
Pickling	545	600	††		††		††		††	

[†] *Data provided by USSC (References 1,2). Production day is 11 p.m. to 11 p.m. for all except electric furnace which is 12 p.m. to 12 p.m.*

[††] *Data not provided by USSC.*

Table 3

DAILY PRODUCTION AT USSC DUQUESNE[†]

January-November 1975

Parameter	Minimum		Maximum		Average	
	Net tons/day					
	m.tons	tons	m.tons	tons	m.tons	tons
Basic Iron Production						
No. 1 B.F.	643	707[††]	1,093	1,202	881	969
No. 3 B.F.	914	1,005	1,247	1,372	1,062	1,168
No. 4 B.F.	969	1,066	1,790	1,969	1,361	1,497
No. 6 B.F.	1,949	2,144	2,849	3,134	2,789	3,068
Total	4,475	4,922	6,979	7,677	6,093	6,702
BOF Steel Production	3,184	3,502	7,021	7,723	5,184	5,702
Electric Furnace Steel Production	0	0	753	828	423	465
Hot Forming Production						
21" Mill	125	138	1,277	1,405	451	496
36" Mill	961	1,057	2,900	3,190	1,726	1,899
46" Mill	171	188	2,038	2,242	580	638
No. 5 Bar Mill	414	455	775	853	650	715
Pickling Production	2.6	2.9	481	529	198	218

[†] *Data provided by USSC*[1]

[††] *Daily values are computed from minimum, maximum and average weekly production figures. Therefore, total blast furnace production numbers are not actual because minimum, maximum and average week for each blast furnace did not necessarily occur at the same time.*

each of blast furnaces No. 1, 3 and 4 and approximately 8,700 m^3/day (2.3 mgd) from blast furnace No. 6.[3] During NEIC monitoring, No. 1 and 3 blast furnaces were not operating. Production from No. 4 and 6 furnaces averaged 4,257 m. tons (4,683 tons)/day, 92% of their combined rated capacity[4] and 61% of the production capacity of all four furnaces.

Blast furnace process wastewaters are discharged to a 27 m (90 ft) diameter gravity thickener. USSC reported that polymer is added to the thickener influent as a flocculating agent;[1] however, during the survey no polymer addition facilities could be located by USSC officials. Thickener underflow is dewatered on disk-type vacuum filters. Filtrate is returned to the thickener. USSC personnel reported that sludge was dewatered 16 hr/day (i.e., swing turn and night turn) and recycled to the thickener influent channel 8 hr/day during the survey.

NEIC monitoring results [Tables 4, 5, 6] indicate that thickener effluent flow was essentially constant, averaging 24,000 m^3/day (6.4 mgd), 45% greater than the 17,000 m^3/day (4.4 mgd) average flow measured by USSC [Table 7]. USSC and NEIC data indicate comparable results for all parameters monitored except phenolics. The average USSC phenolics concentration is seven times greater than the average concentration determined by NEIC [Table 8]. The pollutants of major significance discharged from outfall 111 were total suspended solids (TSS), ammonia (NH_3-N), total cyanide (CN_T), amenable cyanide (CN_A), phenolics, total iron (Fe_T) and zinc (Zn).

The treatment efficiency of the blast furnace thickener was evaluated by NEIC. Influent flows were sampled and composited on a flow-weighted basis. The thickener was very efficient (average of >90%) in removing total suspended solids, total iron and zinc [Table 9]. In addition, an average of greater than 50% of the settleable solids, oil and grease and phenolics were removed. Ammonia, cyanide and dissolved iron removals were negligible.

Table 4
FIELD MEASUREMENTS AND ANALYTICAL DATA
USSC DUQUESNE
February 26 - March 6, 1978

Station Description	Date[a]	Flow[b]		pH Range	Temp. Range (°C)	Settleable Solids (ml/l)	Gross/Net[c]	TSS			Ammonia			Total Cyanide			Amenable Cyanide		
		m³/day x 10³	mgd					mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Water Intake	2/27			7.2-8.0	11.5-12	0.1	G	75			0.27			0.01			<0.01		
	2/28			6.2-6.8	11.8-13.5	0.9	G	110			0.31			0.02			0.01		
	2/29			6.7-7.4	10-13	0.1	G	27			0.24			<0.01			<0.01		
	3/4			6.9-8.2	11.5-16.0	<0.1	G	24			0.34			0.01			<0.01[d]		
	3/5			6.7-7.2	12.5-16.0	<0.1	G	52			0.35			0.03			0.01[d]		
	3/6			6.0-7.3	14.5-16.5	<0.1	G	20			0.36			0.07			0.01		
Blast Furnace Thickener Effluent (111)	3/4	24	6.3	6.5-7.4	37-42	<0.1	G	110	2,600	5,700	27	640	1,400	9.0	210	470	5.5[d]	130	290
	3/5	25	6.5	6.0-6.9	32-50	37	G	59	1,500	3,200	20	490	1,100	6.5	160	350	4.0[d]	99	220
	3/6	24	6.4	5.9-6.4	33-39	<0.1	G	70	1,700	3,700	16	390	850	3.2	77	170	1.2	29	64
	3/4						N	86	2,000	4,500	27	630	1,400	9.0	210	470	5.5	130	290
	3/5						N	7	170	380	20	480	1,100	6.5	160	350	4.0	98	220
	3/6						N	50	1,200	2,700	16	380	830	3.1	76	170	1.2	29	63
No. 4 B.F. Granulated Slag Pit Overflow (211)	3/4	8.4	2.2	6.8-7.2	30-37	<0.1	G	39	330	720	3.1[d]	26	57	0.17	1.4	3.1	0.05[d]	0.42	0.92
	3/5	18	4.9	5.2-7.1	20-45	<0.1	G	210	3,900	8,500	1.8[d]	33	73	0.08	1.5	3.2	0.02[d]	0.37	0.81
	3/6	22	5.8	5.9-7.3	20-48	0.1	G	280	6,200	14,000	2.5[d]	55	121	0.24	5.3	11.7	<0.01	<0.22	<0.48
	3/4						N	15	130	280	2.8	23	51	0.16	1.3	2.9	0.05	0.42	0.92
	3/5						N	160	2,900	6,400	1.4	27	59	0.05	0.92	2.0	0.01	0.18	0.40
	3/6						N	260	5,700	13,000	2.1	47	100	0.17	3.8	8.3	*	-	-
111 plus 211 plus No. 6 B.F. Cooling Water (011)	3/4	180	48	6.6-7.3	19-25	0.2	G	33	6,000	13,000	1.6	290	630	3.5	630	1,400	2.6[d]	470	1,000
	3/5	190	50	6.6-8.3	22.5-26	<0.1	G	55	10,000	23,000	3.0	570	1,300	3.0	570	1,300	2.5[d]	480	1,000
	3/6	210	56	6.7-7.7	21-25	0.1	G	43	9,200	20,000	2.4	510	1,100	2.2	470	1,000	1.7	360	800
	3/4						N	9	1,600	3,600	1.3	230	500	3.5	630	1,400	2.6	470	1,000
	3/5						N	3	570	1,300	2.6	500	1,100	3.0	560	1,200	2.5	470	1,000
	3/6						N	23	4,900	11,000	2.0	430	960	2.1	450	1,000	1.7	360	790
Discharge from overflow box at Linde Oxygen Plant (012)	3/4	140	37	6.9-8.3	18-20	<0.1	G	16	2,300	5,000	0.37[d]	52	120	0.02	2.8	6.2	<0.01[d]	<1.4	<3.1
	3/5	160	42	6.7-7.4	19-22	<0.1	G	54	8,600	19,000	0.45[d]	71	160	0.02	3.2	7.0	0.01[d]	1.6	3.5
	3/6	160	43	6.8-7.5	20-22	<0.1	G	26	4,300	9,400	0.45[d]	74	160	0.05	8.2	18	0.01	1.6	3.6
	3/4						N	*	-	-	0.03	4.3	9.4	0.01	1.4	3.1	0	0	0
	3/5						N	2	320	700	0.10	16	35	*	-	-	0	0	0
	3/6						N	6	990	2,200	0.09	15	33	*	-	-	0	0	0
Upsewer flow from City of Duquesne to Outfall 013	3/4	6.2	1.6	7.0-11.5	12-13	7.5	G	150	940	2,100	5.1[d]	32	70	0.10	0.62	1.4	<0.01[d]	<0.06	<0.13
	3/5	4.0	1.1	6.9-8.3	12-15	3	G	150	600	1,300	4.8[d]	19	42	0.06	0.24	0.53	0.01[d]	0.04	0.09
	3/6	3.0	0.8	6.9-7.9	10.5-14	5	G	77	230	520	4.6[d]	14	31	0.02	0.06	0.13	0.01	0.03	0.07
No. 4 B.F. Cooling Water and upsewer flow from City of Duquesne (013)	3/4	35	9.1	7.1-9.4	17-20	0.5	G	180	6,200	14,000	0.44	15	34	0.02	0.69	1.5	<0.01[d]	<0.34	<0.76
	3/5	39	10	7.0-10.2	16-20	0.4	G	110	4,300	9,400	0.50	19	43	0.01	0.39	0.85	<0.01[d]	<0.40	<0.87
	3/6	40	10	6.9-9.0	17-20	0.2	G	35	1,400	3,100	0.62	25	54	0.06	2.4	5.2	0.01	0.40	0.87
	3/4	28	7.5				N	162	4,600	10,000	*	-	-	*	-	-	0	0	0
	3/5	34	8.9				N	53	1,800	3,900	*	-	-	*	-	-	*	-	-
	3/6	35	9.2				N	11	380	840	*	-	-	*	-	-	0	0	0

Table 4 (Continued)

FIELD MEASUREMENTS AND ANALYTICAL DATA

Station Description	Date[a]	Flow[b]		pH Range	Temp. Range (°C)	Settleable Solids (ml/l)	Gross/Net[c]	TSS			Ammonia			Total Cyanide			Amenable Cyanide		
		m³/day x 10³	mgd					mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
BOP Thickener Effluent (114)	3/4	8.0	2.1	11.3-11.7	34-45	0.1	G	69	550	1,200	0.78	6.2	14	0.02	0.16	0.35	<0.01[d]	<0.08	<0.18
	3/5	9.9	2.6	11.0-11.7	37-44	<0.1	G	49	490	1,100	0.72	7.2	16	0.04	0.40	0.88	0.02[d]	0.20	0.44
	3/6	8.1	2.2	10.8-11.5	35-42	<0.1	G	44	360	790	0.95	7.7	17	0.01	0.08	0.18	<0.01	<0.08	<0.18
	3/4						N	45	360	790	0.44	3.5	7.8	0.01	0.08	0.18	<0.01[d]	<0.08	<0.18
	3/5						N	[e]	-	-	0.37	3.7	8.1	0.01	0.10	0.22	0.01[d]	0.10	0.22
	3/6						N	24	200	430	0.59	4.8	11	[e]	-	-	0	0	0
BOP Cooling Water and Thickener Effluent (014)	3/4	35	9.2	10.4-11.4	25-53	8	G	82	2,900	6,300	0.37	13	28	0.02	0.70	1.5	<0.01[d]	<0.35	<0.77
	3/5	35	9.3	10.0-11.3	23-55	35	G	84	3,000	6,500	0.40	14	31	0.01	0.35	0.77	<0.01[d]	<0.35	<0.78
	3/6	39	10.4	10.3-11.0	22-50	12	G	94	3,700	8,200	0.45	18	39	0.04	1.6	3.5	<0.01	<0.39	<0.87
	3/4						N	58	2,000	4,400	0.03	1.0	2.3	0.01	0.35	0.76	0	0	0
	3/5						N	32	1,100	2,500	0.05	1.8	3.9	[e]	-	-	[e]	-	-
	3/6						N	74	2,900	6,400	0.09	3.6	7.8	[e]	-	-	[e]	-	-
Discharge from 21", 36" and 46" primary mills (015)	2/27	82	22	8.5-10.0	12.5-17	0.4	G	66	5,400	12,000									
	2/28	93	24	7.5-9.0	12-16.5	0.1	G	49	4,600	10,000									
	2/29	83	22	7.6-10.2	12-18.5	<0.1	G	33	2,800	6,100									
	2/27						N	[e]	-	-									
	2/28						N	[e]	-	-									
	2/29						N	6	480	1,100									
Discharge from Electric Furnace and upsewer flow from City of Duquesne (016)	2/27	21[f]	5.5	7.6-9.0	15-20.5	0.8	G	85	1,800	3,900	0.70	15	32	0.04	0.84	1.8	0.03	0.63	1.4
	2/28	24	6.3	7.1-8.6	14-22.5	0.1	G	45	1,100	2,400	0.71	17	37	0.01	0.24	0.53	<0.01	<0.24	<0.53
	2/29	30	7.9	7.4-9.4	14-20	0.4	G	48	1,400	3,200	0.67	20	44	0.03	0.90	2.0	0.02	0.60	1.3
	2/27						N[g]	10	210	460	0.43	9	20	0.03	0.63	1.4	0.02	0.4	0.9
	2/28						N	[e]	-	-	0.40	10	21	[e]	-	-	0	0	0
	2/29						N	21	630	1,400	0.43	13	28	0.02	0.60	1.3	0.01	0.3	0.7
No. 5 Bar Mill and Heat Treating Discharges (017)	2/27	30	7.8	7.7-9.5	18-21	0.2	G	95	2,900	6,300									
	2/28	35	9.3	7.6-8.6	13-20	<0.1	G	38	1,300	2,900									
	2/29	29	7.6	7.3-8.6	12-15	<0.1	G	36	1,000	2,300									
	2/27						N	21	620	1,400									
	2/28						N	[e]	-	-									
	2/29						N	9	260	570									

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[a] *Date is the day the sample was composited (i.e., 24-hour composite 0600 September 27 to 0600 September 28 was dated September 28.*

[b] *Daily average flows are average of eight instantaneous flows during 24-hour sampling period.*

[c] *Net values based on gross concentrations minus intake concentrations. Upsewer load was also subtracted from Outfall 013 since upsewer flow was measured.*

[d] *Samples exceeded recommended holding time due to rerouting of airline flight from Pittsburgh to Denver when Denver airport was closed due to blizzard.*

[e] *Net concentration is negative value therefore load was not calculated.*

[f] *Upsewer flow to 016 was not measured or sampled due to limited access to sewer. Upsewer flow was visually estimated by NEIC 4,200 m³/day (1.1 mgd).*

[g] *Net values determined by subtracting intake concentrations from gross concentrations for entire flow.*

Table 8

OIL AND GREASE AND PHENOLIC DATA[†]
USSC DUQUESNE
February 26-March 6, 1976

Station Description	Date	Time	Instantaneous Flow[††] m^3/day x 10^3	Instantaneous Flow[††] mgd	Oil and Grease[†††] mg/l	Oil and Grease[†††] kg/day	Oil and Grease[†††] lb/day	Phenolics µg/l	Phenolics kg/day	Phenolics lb/day
Water Intake	2/26	1520			2			6		
	2/26	1820			3			<5		
	2/27	0010			3			<5		
		Daily Average			3			<5		
	2/27	1523			6			6		
	2/27	1806			4			<5		
	2/28	2400			6			<5		
		Daily Average			5			<5		
	2/28	1520			<1			5		
	2/28	1810			<1			<5		
	2/29	0005			<1			<5		
		Daily Average			<1			<5		
	3/3	1700			<1			<5		
	3/3	1850			<1			<5		
	3/4	0030			<1			<5		
		Daily Average			<1			<5		
	3/4	1645			5			6		
	3/4	1830			4			<5		
	3/5	0030			5			<5		
		Daily Average			5			<5		
	3/5	1615			4			<5		
	3/5	1850			4			<5		
	3/6	0020			6			<5		
		Daily Average			5			<5		
Blast Furnace Thickener Effluent (111)	3/3	1500	35	9.3	2	70	200	1,200	42	93
	3/3	1835	26	6.8	2	50	100	860	22	49
	3/4	0040	3.2	0.83	<1	<3.2	<6.9	110	0.35	0.76
		Gross Daily Average			2	40	100	720	21	48
		Net Daily Average[††††]			1	20	50	720	21	48
	3/4	1505	31	8.1	4	100	300	150	4.6	10
	3/4	1815	34	9.0	3	100	200	540	18	40
	3/5	0040	22	5.8	4	90	200	640	14	31
		Gross Daily Average			4	100	200	440	12	27
		Net Daily Average			*	-	-	440	12	27
	3/5	1500	12	3.3	5	60	100	39	0.48	1.1
	3/5	1810	36	9.4	6	200	500	230	8.2	18
	3/6	0015	19	5.1	7	100	300	350	6.7	15
		Gross Daily Average			6	100	300	200	5.1	11
		Net Daily AVerage			1	20	50	200	5.1	11
No. 4 Blast Furnace Granulated Slag Pit Overflow (211)	3/3	1500	10	2.8	1	10	20	8	0.08	0.2
	3/3	1900	3.0	0.80	<1	<3	<7	<5	<0.02	<0.03
	3/4	0115	6.9	1.8	<1	<7	<20	9	0.06	0.1
		Gross Daily Average			<1	<7	<20	<7	<0.05	<0.1
		Net Daily Average			0	0	0	<2	<0.01	<0.02
	3/4	1600	16	4.1	11	170	380	5	0.08	0.2
	3/4	1845	23	6.0	4	90	200	<5	<0.1	<0.3
	3/5	0030	18	4.9	4	70	200	<5	<0.09	<0.2
		Gross Daily Average			6	100	300	<5	<0.1	<0.3
		Net Daily Average			1	20	50	0	0	0

Table 5 (Continued)

OIL AND GREASE AND PHENOLIC DATA[†]

Station Description	Date	Time	Instantaneous Flow[††]		Oil and Grease[†††]			Phenolics		
			m^3/day x 10^3	mgd	mg/l	kg/day	lb/day	µg/l	kg/day	lb/day
No. 4 Blast Furnace Granulated Slag Pit Overflow(211) (Continued)	3/5	1530	35	9.1	7	200	500	**	-	-
	3/5	1905	8.2	2.2	5	40	90	<5	<0.04	<0.09
	3/6	0045	25	6.6	7	200	400	<5	<0.1	<0.3
		Gross Daily Average			6	100	300	<5	<0.04	<0.09
		Net Daily Average			1	20	50	0	0	0
111 plus 211 plus No. 6 Blast Furnace Cooling Water (011)	3/3	1635	170	44	<1	<200	<400	140	24	52
	3/3	1830	220	58	<1	<200	<500	86	19	42
	3/4	0230	180	47	2	400	800	33	5.9	13
		Gross Daily Average			<1	<300	<600	86	16	36
		Net Daily Average			0	0	0	81	15	34
	3/4	1620	200	53	5	1,000	2,000	85	17	37
	3/4	1820	190	51	5	1,000	2,000	92	18	39
	3/5	0020	190	50	3	600	1,000	64	12	27
		Gross Daily Average			4	900	2,000	80	16	34
		Net Daily Average			*	-	-	75	15	32
	3/5	1615	270	71	5	1,000	3,000	11	3.0	6.5
	3/5	1840	200	54	6	1,000	3,000	67	14	30
	3/6	0015	160	41	5	800	2,000	50	7.8	17
		Gross Daily Average			5	900	3,000	43	8.3	18
		Net Daily Average			0	0	0	38	7.3	16
Discharge from Overflow Box at Linde Oxygen Plant (012)	3/3	1625	95	25	2	200	400			
	3/3	1810	170	46	2	300	800			
	3/4	0050	160	44	3	500	1,000			
		Gross Daily Average			2	300	700			
		Net Daily Average			1	200	400			
	3/4	1615	140	37	2	300	600			
	3/4	1840	180	48	3	500	1,000			
	3/5	0040	140	38	2	300	600			
		Gross Daily Average			2	400	700			
		Net Daily Average			*	0	0			
	3/5	1635	200	54	6	1,000	3,000			
	3/5	1905	170	44	9	1,000	3,000			
	3/6	0040	110	30	6	700	1,000			
		Gross Daily Average			7	900	2,000			
		Net Daily Average			2	300	600			
Upsewer Flow from City of Duquesne to Outfall 013	3/3	1515	3.0	0.78	380	1,100	2,500	39	0.12	0.26
	3/3	2035	3.3	0.86	640	2,100	4,600	35	0.11	0.25
	3/4	0210	4.8	1.3	3	10	30	13	0.06	0.14
		Daily Average			340	1,100	2,400	29	0.10	0.22
	3/4	1515	3.4	0.89	14	47	100	34	0.11	0.25
	3/4	1950	3.8	1.0	43	160	360	40	0.15	0.33
	3/5	0140	3.4	0.89	8	30	60	27	0.09	0.20
		Daily Average			22	79	170	34	0.12	0.26
	3/5	1505	3.0	0.78	31	92	200	37	0.11	0.24
	3/5	1955	2.9	0.76	34	98	220	47	0.14	0.30
	3/6	0135	2.4	0.63	16	39	85	29	0.07	0.15
		Daily Average			27	76	170	38	0.11	0.23

Table 5 (Continued)

OIL AND GREASE AND PHENOLIC DATA†

Station Description	Date	Time	Instantaneous Flow††		Oil and Grease†††			Phenolics		
			m³/day x 10³	mgd	mg/l	kg/day	lb/day	µg/l	kg/day	lb/day
No. 4 Blast Furnace Cooling Water and Upsewer Flow from City of Duquesne (013)	3/3	1645	39	10	2	80	200	5	0.2	0.4
	3/3	1835	37	9.8	5	200	400	5	0.2	0.4
	3/4	0030	42	11	2	80	200	<5	<0.2	<0.5
		Gross Daily Average			3	100	300	<5	<0.2	<0.4
		Net Daily Average			*	-	-	0	0	0
	3/4	1630	32	8.4	4	100	300	11	0.3	0.8
	3/4	1830	39	10	4	200	300	**	-	-
	3/5	0025	49	13	3	100	300	<5	<0.2	<0.5
		Gross Daily Average			4	100	300	<5	<0.2	<0.4
		Net Daily Average			*	-	-	0	0	0
	3/5	1615	35	9.2	8	300	600	6	0.2	0.5
	3/5	1845	34	9.0	7	200	500	7	0.2	0.5
	3/6	0015	39	10	7	300	600	5	0.2	0.4
		Gross Daily Average			7	300	600	6	0.2	0.5
		Net Daily Average			2	90	170	*	-	-
BOP Thickener Effluent (114)	3/3	1545	9.4	2.5	2	20	40	5	0.05	0.1
	3/3	2020	7.8	2.1	<1	<10	<20	6	0.05	0.1
	3/4	0130	9.8	2.6	<1	<10	<20	12	0.10	0.30
		Gross Daily Average			<1	<10	<20	8	0.07	0.1
		Net Daily Average			0	0	0	3	0.03	0.04
	3/4	1545	7.8	2.1	4	30	70	10	0.080	0.17
	3/4	1914	8.4	2.2	2	20	40	9	0.08	0.2
	3/5	0115	8.7	2.3	2	20	40	9	0.08	0.2
		Gross Daily Average			3	20	50	9	0.08	0.2
		Net Daily Average			*	-	-	4	0.04	0.09
	3/5	1530	7.8	2.1	6	50	100	16	0.12	0.27
	3/5	1930	8.5	2.3	6	50	100	10	0.085	0.19
	3/6	0110	7.2	1.9	7	50	100	12	0.090	0.19
		Gross Daily Average			6	50	100	13	0.10	0.22
		Net Daily Average			1	10	10	8	0.06	0.1
BOP Cooling Water and Thickener Effluent (014)	3/3	1610	28	7.4	0	0	0	<5	<0.1	<0.3
	3/3	2000	36	9.6	2	70	200	<5	<0.2	<0.4
	3/4	0120	35	9.1	4	100	300	<5	<0.2	<0.4
		Gross Daily Average			3	60	200	<5	<0.2	<0.4
		Net Daily Average			2	40	100	0	0	0
	3/4	1600	36	9.5	2	70	200	6	0.2	0.5
	3/4	1855	36	9.6	3	100	200	<5	<0.2	<0.4
	3/5	0100	34	9.0	4	100	300	<5	<0.2	<0.4
		Gross Daily Average			3	90	200	<5	<0.2	<0.4
		Net Daily Average			*	-	-	0	0	0
	3/5	1550	43	11	7	300	700	6	0.3	0.6
	3/5	1915	29	7.7	6	200	400	<5	<0.1	<0.3
	3/6	0055	30	8.0	7	200	500	6	0.2	0.4
		Gross Daily Average			7	200	500	<6	<0.2	<0.4
		Net Daily Average			2	60	100	1	0	<0.1
Discharge from 21",36" and 46" Primary Mills (015)	2/26	1535	87	23	3	300	600	<5	<0.4	<1
	2/26	1845	70	18	3	200	500	<5	<0.3	<0.8
	2/27	0040	85	22	4	300	700	<5	<0.4	<0.9
		Gross Daily Average			3	300	600	<5	<0.4	<0.9
		Net Daily Average			0	0	0	0	0	0

Table 5 (Continued)

OIL AND GREASE AND PHENOLIC DATA†

Station Description	Date	Time	Instantaneous Flow††		Oil and Grease†††			Phenolics		
			m³/day x 10³	mgd	mg/l	kg/day	lb/day	µg/l	kg/day	lb/day
Discharge from 21", 36" and 46" Primary Mills (015) (Cont.)	2/27	1535	92	24	4	400	800	<5	<0.5	<1
	2/27	1830	89	23	2	200	400	<5	<0.4	<1
	2/28	0020	83	22	2	200	400	<5	<0.4	<0.9
	Gross Daily Average				3	300	500	<5	<0.4	<1
	Net Daily Average				*	-	-	0	0	0
	2/28	1520	99	26	<1	100	200	***	-	-
	2/28	1925	84	22	<1	100	200	<5	<0.4	<0.9
	2/29	0115	90	24	25	2,000	5,000	10	0.90	2.0
	Gross Daily Average				8	700	2,000	<5	<0.4	<0.9
	Net Daily Average				7	600	1,800	0	0	0
Discharge from Electric Furnace and Upsewer Flow from City of Duquesne (016)	2/26	1550	14	3.8	5	70	200	15	0.21	0.47
	2/26	1905	45	12	5	200	500	6	0.3	0.6
	2/27	0055	22	5.9	4	90	200	6	0.1	0.3
	Gross Daily Average				5	100	300	9	0.2	0.5
	Net Daily Average				2	40	100	4	0.1	0.2
	2/27	1545	33	8.8	8	300	600	5	0.2	0.4
	2/27	1845	19	5.0	4	80	200	7	0.1	0.3
	2/28	0035	24	6.3	5	100	300	8	0.2	0.4
	Gross Daily Average				6	200	400	7	0.2	0.4
	Net Daily Average				1	30	70	2	0.1	0.1
	2/28	1540	27	7.1	<1	<30	<60	***	-	-
	2/28	1850	39	10	<1	<40	<90	5	0.2	0.4
	2/29	0045	43	11	<1	<40	<90	<5	<0.2	<0.5
	Gross Daily Average				<1	<40	<90	<3	<0.1	<0.3
	Net Daily Average				0	0	0	*	-	-
No. 5 Bar Mill and Heat Treating Discharges (017)	2/26	1520	33	8.7	4	100	300	<5	<0.2	<0.4
	2/26	1825	24	6.2	6	100	300	<5	<0.1	<0.3
	2/27	0020	29	7.6	4	100	300	<5	<0.1	<0.3
	Gross Daily Average				5	100	300	<5	<0.1	<0.3
	Net Daily Average				2	40	100	0	0	0
	2/27	1525	37	9.8	5	200	400	<5	<0.2	<0.4
	2/27	1815	35	9.2	5	200	400	<5	<0.2	<0.4
	2/28	0005	35	9.1	7	200	500	<5	<0.2	<0.4
	Gross Daily Average				6	200	400	<5	<0.2	<0.4
	Net Daily Average				1	30	70	0	0	0
	2/28	1505	28	7.4	1	30	60	***	-	-
	2/28	1905	25	6.7	<1	<30	<60	<5	<0.1	<0.3
	2/29	0100	28	7.4	<1	<30	<60	<5	<0.1	<0.3
	Gross Daily Average				<1	<30	<60	<3	<0.1	<0.2
	Net Daily Average				0	0	0	*	-	-

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† *All data are based on grab samples. Sampling day is from 6:00 a.m. to 6:00 a.m.*

†† *Loads are calculated using instantaneous flows. Daily flows are average of eight instantaneous flows during 24-hour sampling period.*

††† *Freon extractable material.*

†††† *Net values are computed based on gross daily average concentrations minus daily average intake water concentrations. Upsewer load was also subtracted from Outfall 013.*

* *Gross concentrations are less than intake concentrations and/or upsewer concentrations and thus net concentrations and loads are not meaningful.*

** *Sample bottle was broken in shipment.*

*** *Sample not analyzed because holding time was exceeded.*

Table 6

METALS AND FLUORIDE DATA
USSC DUQUESNE
February 26 - March 6, 1976

Station Description	Date†	Flow††		Gross/Net†††	Total Iron			Dissolved Iron			Zinc			Fluoride		
		m³/day x 10³	mgd		mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Water Intake	2/27				3.7			0.03			0.06			0.15		
	2/28				6.5			0.11			0.10			0.11		
	2/29				2.2			0.06			0.05			0.10		
	3/4				1.5			0.03			0.07			0.10		
	3/5				1.7			0.01			0.07			0.12		
	3/6				1.1			0.01			0.07			0.11		
Blast Furnace Thickener Effluent (111)	3/4	24	6.3	G	11.1	260	580	0.95	23	50	7.6	180	400			
	3/5	25	6.5	G	7.1	170	380	0.65	16	35	4.9	120	270			
	3/6	24	6.4	G	8.2	200	440	0.27	6.5	14	4.7	110	250			
	3/4			N	9.6	230	500	0.92	22	48	7.5	180	390			
	3/5			N	5.4	130	290	0.64	16	35	4.8	120	260			
	3/6			N	7.1	170	380	0.26	6.3	14	4.6	110	250			
No. 4 B.F. Granulated Slag Pit Overflow (211)	3/4	8.3	2.2	G	1.8	15	33	0.02	0.17	0.37	0.10	0.84	1.8			
	3/5	18	4.9	G	2.3	42	93	0.01	0.18	0.40	0.07	1.3	2.8			
	3/6	22	5.8	G	2.0	44	97	0.07	1.5	3.4	0.08	1.8	3.9			
	3/4			N	0.3	2.5	5.5	*	-	-	0.03	0.25	0.55			
	3/5			N	0.6	11	24	0	0	0	0	0	0			
	3/6			N	0.9	20	44	0.06	1.3	2.9	0.01	0.22	0.49			
111 plus 211 plus No. 6 B.F. Cooling Water (011)	3/4	180	48	G	3.3	600	1,300	0.18	32	71	1.6	290	640			
	3/5	190	50	G	3.3	630	1,400	0.05	9.5	21	0.93	180	390			
	3/6	210	56	G	2.4	510	1,100	0.05	11	23	0.63	130	300			
	3/4			N	1.8	320	710	0.15	27	60	1.6	280	620			
	3/5			N	1.6	300	670	0.04	7.6	17	0.86	160	360			
	3/6			N	1.3	280	610	0.05	11	23	0.56	120	260			
Discharge from overflow box at Linde Oxygen Plant (012)	3/4	140	37	G	1.4	200	440	0.02	2.8	6.2	0.07	9.9	22			
	3/5	160	42	G	1.5	240	520	0.02	3.2	7.0	0.07	11	24			
	3/6	160	43	G	1.4	230	510	0.03	4.9	11	0.07	12	25			
	3/4			N	*	-	-	*	-	-	0	0	0			
	3/5			N	*	-	-	0.01	1.6	3.5	0	0	0			
	3/6			N	0.3	49	110	0.03	4.9	11	0	0	0			
Upsewer flow from City of Duquesne to Outfall 013	3/4	6.2	1.6	G	3.0	19	41	0.30	1.9	4.1	0.24	1.5	3.3			
	3/5	4.0	1.1	G	1.1	4.4	9.8	0.04	0.16	0.35	0.14	0.56	1.2			
	3/6	3.0	0.80	G	1.1	3.4	7.4	0.05	0.15	0.34	0.14	0.43	0.94			

Table 6 (Continued)

METALS AND FLUORIDE DATA

Station Description	Date†	Flow††		Gross / Net†††	Total Iron			Dissolved Iron			Zinc			Fluoride		
		m³/day x 10³	mgd		mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
No. 4 B.F. Cooling Water and upsewer flow from City of Duquesne (013)	3/4	35	9.1	G	6.4	220	490	0.01	0.35	0.76	0.26	9.0	20			
	3/5	39	10	G	2.5	97	210	0.34	13	29	0.10	3.9	8.5			
	3/6	40	10	G	1.6	63	140	0.01	0.40	0.87	0.09	3.6	7.9			
	3/4	29	7.5	N	5.6	160	350	*	-	-	0.19	6.6	14			
	3/5	35	8.9	N	1.0	34	74	0.37	13	28	0.03	1.2	2.6			
	3/6	37	9.2	N	0.5	20	44	0.01	0.40	0.87	0.02	0.79	1.7			
BOP Thickener effluent (114)	3/4	8.0	2.1	G	12.7	100	220	0.07	0.56	1.2	0.16	1.3	2.8	8.9	71	160
	3/5	9.9	2.6	G	10.6	110	230	0.35	3.5	7.7	0.12	1.2	2.6	9.2	92	200
	3/6	8.1	2.2	G	6.7	55	120	0.05	0.41	0.90	0.16	1.3	2.9	8.4	68	150
	3/4			N	11.2	90	200	0.04	0.32	0.70	0.09	0.72	1.6	8.8	71	160
	3/5			N	8.9	89	200	0.34	3.4	7.5	0.05	0.50	1.1	9.1	90	200
	3/6			N	5.6	46	100	0.04	0.33	0.72	0.09	0.73	1.6	8.3	68	150
BOP Cooling water and thickener effluent (014)	3/4	35	9.2	G	5.7	200	440	0.02	0.70	1.5	0.12	4.2	9.2	1.9	66	150
	3/5	35	9.3	G	5.4	190	420	0.01	0.35	0.77	0.09	3.2	7.0	2.0	70	150
	3/6	39	10	G	3.5	140	300	0.02	0.79	1.7	0.09	3.6	7.8	1.8	71	160
	3/4			N	4.2	150	320	*	-	-	0.05	1.7	3.8	1.9	66	150
	3/5			N	3.7	130	290	0	0	0	0.02	0.70	1.5	1.9	66	150
	3/6			N	2.4	95	210	0.02	0.79	1.7	0.02	0.79	1.7	1.7	67	150
Discharge from 21", 36" and 46" primary mills (015)	2/27	82	22	G	4.8	390	870	0.04	3.3	7.2	0.06	4.9	11			
	2/28	93	25	G	5.8	540	1,200	0.02	1.9	4.1	0.07	6.5	14			
	2/29	80	21	G	1.8	140	320	0.02	1.6	3.5	0.04	3.2	7.0			
	2/27			N	1.1	90	200	0.01	0.82	1.8	0	0	0			
	2/28			N	*	-	-	*	-	-	*	-	-			
	2/29			N	*	-	-	*	-	-	*	-	-			
Discharge from Electric Furnace and upsewer flow from City of Duquesne (016)	2/27	21	5.5**	G	5.0	110	230	0.13	2.7	6.0	0.10	2.1	4.6	0.19	4.0	8.8
	2/28	24	6.3	G	3.6	86	190	0.08	1.9	4.2	0.12	2.9	6.3	0.14	3.4	7.4
	2/29	30	7.9	G	2.6	78	170	0.08	3.4	5.3	0.08	2.4	5.3	0.14	4.2	9.2
	2/27			N***	1.3	27	60	0.10	2.1	4.6	0.04	0.84	1.8	0.04	0.84	1.8
	2/28			N	*	-	-	*	-	-	0.02	0.48	1.1	0.03	0.72	1.6
	2/29			N	0.40	12	26	0.02	0.60	1.3	0.03	0.90	2.0	0.04	1.2	2.6
No. 5 Bar Mill and Heat Treating Discharges (017)	2/27	30	7.8	G	6.6	200	430	0.02	0.59	1.3	0.08	2.4	5.2			
	2/28	35	9.3	G	3.9	140	300	0.03	1.1	2.3	0.07	2.4	5.4			
	2/29	29	7.6	G	2.5	72	160	0.03	0.86	1.9	0.07	2.0	4.4			
	2/27			N	2.9	86	190	*	-	-	0.02	0.59	1.3			
	2/28			N	*	-	-	*	-	-	*	-	-			
	2/29			N	0.30	8.6	19	*	-	-	0.02	0.57	1.3			

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† *Date is the day the sample was composited (i.e., 24-hour composite 0600 September 27 to 0600 September 28 was dated September 28.*

†† *Daily average flows are average of eight instantaneous flows during 24-hour sampling period.*

††† *Net values based on gross concentrations minus intake concentrations. Upsewer load was also subtracted from Outfall 013 since upsewer flow was measured.*

* *Net concentration is negative value therefore load was not calculated.*

** *Upsewer flow to 016 was not measured or sampled due to limited access to sewer. Upsewer flow was visually estimated by NEIC at 4,200 m³/day (1.1 mgd).*

*** *Net values determined by subtracting intake concentrations from gross concentrations for entire flow.*

Table 7

SUMMARY OF SELF-MONITORING DATA
USSC DUQUESNE
January-October 1975

Outfall		Flow†		Temperature		pH	TSS	Oil and Grease	Phenols	NH_3-N	CN_T	CN_A	Fe_D
		$m^3 \times 10^3$/day	mgd	°C	°F		mg/l						
011	Average††	108	28.5	26	79	7.0							
	Range*	44.7-203	11.8-53.6	21-40	70-104	7.2-7.6							
	Samples	8		16		16							
111	Average	17	4.4	39	102	7.5	53		3.2	29	3.2	3.1	
	Range	10-26	2.7-6.9	17-47	63-117	6.7-8.8	**-1,022		0.02-12.4	3.3-60	0.3-13.7	0.2-13.0	
	Samples	6		20		20	20		22	17	20	21	
211	Average	12	3.1			9.3	74						
	Range	6.1-21	1.6-5.5			8.1-11.0	**-524						
	Samples	7				6	20						
012	Average	129	34.1	28	82.7	7.9							
	Range	73.8-190	19.5-50.2	17-70	63-158	7.3-11							
	Samples	9		17		17							
112	Average	0.4	0.1			9.8	**						
	Range	0.4	0.1			8.3-11.1	**-30						
	Samples	-				7	30						
013	Average	15	3.9	24	75.5	8.2		1.7					
	Range	4.2-20	1.1-5.4	19-32	66-89.6	7.3-9.8		**-5.3					
	Samples	10		13		13		7					
014	Average	33	8.6	37	98.5	10.9							
	Range	26-38.2	6.8-10.1	28-47	82-117	9.1-11.8							
	Samples	10		18		14							
114	Average	10	2.7			11.2	225						0.074
	Range	4.9-21	1.3-5.5			9.0-12.1	**-3,764						**-0.1
	Samples	11				22	19						20
015	Average	84.0	22.2	20	68	9.4	26.9	**					
	Range	28-196	7.5-51.7	6.1-35	43-95	8.2-11.6	**-132	**-9.8					
	Samples	14		24		24	20	60					
016	Average	22	5.7	20	67.9	8.1	9.0	**					
	Range	11-40.1	2.9-10.6	7.5-36	46-96.8	4.3-9.9	**-73	**-115					
	Samples	10		24		21	20	60					
017	Average	31	8.3	23	74	8.2	30.3	2.7			0.026		1.6
	Range	20-51.1	5.2-13.5	7.2-38	45-100.4	6.6-9.3	**-112	**-276			**-0.24		0.02-7
	Samples	12		24		22	20	60			13		10
Intake	Average	401	105.9	20	67.3	7.8	42.3	10.12	0.17	0.64	0.007	0.004	0.117
	Range	282-492	74.6-130	12-29	54-84	7.4-8.6	5.5-153.9	0.13-89.5	0-0.039	0-1.4	0-0.03	0-0.03	0.03-0.2
	Samples	16		15		8	13	12	13	14	12	13	10

† *Only measured flows are tabulated except for outfall 112 which is estimated flow.*
†† *Average is average of monthly averages for all outfalls. All concentrations are net.*
* *Range is maximum and minimum of individual measurements for all outfalls.*
** *Concentration of discharge was less than that of intake.*

Table 8

COMPARISON OF USSC SELF-MONITORING DATA AND NEIC SURVEY DATA[†]
OUTFALL 111
USSC DUQUESNE

Parameter	USSC Concentration mg/l	NEIC[††] Concentration mg/l	NEIC[††] Load kg/day	NEIC[††] Load lb/day
TSS	53	48	1,100	2,500
NH_3-N	29	21	500	1,100
CN_T	3.2	6.2	150	330
CN_A	3.1	3.6	86	190
O/G	-	1	10	30
Phenolics	3.2	0.45	13	29
Fe_T	-	7.4	180	390
Fe_D	-	0.61	15	32
Zn	-	5.6	140	300

Field Measurements	USSC	NEIC
pH Range	6.7-8.8	5.9-7.4
Temperature Range °C	17-47	32-50
Settleable Solids Range ml/l	-	<0.1-37
Average Flow m^3/day x 10^3	17	24
mgd	4.4	6.4

[†] *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake). USSC self-monitoring data is for the period January-October 1975.*

[††] *NEIC data, excluding field measurements, are average of three consecutive days of monitoring from March 3-6, 1976.*

Table 8

TREATMENT EFFICIENCY OF BLAST FURNACE THICKENER
USSC DUQUESNE
March 3-6, 1976

Parameter	Date	Concentration† Influent mg/l	Concentration† Effluent mg/l	% Removal
TSS	3/4††	2,000	110	94
	3/5	2,600	59	98
	3/6	2,650	70	97
	Average	2,400	80	97
Settleable Solids	3/3	31†††	<0.1	100
	3/4	32	37	*
	3/5	45	<0.1	100
	Average	36	12	67
NH_3-N	3/4	29	27	*
	3/5	20	20	0
	3/6	16	16	0
	Average	22	21	*
CN_T	3/4	7.0	9.0	*
	3/5	8.8	6.5	26
	3/6	5.0	3.2	36
	Average	6.9	6.2	10
CN_A	3/4	3.8**	5.5**	*
	3/5	4.3**	4.0**	7
	3/6	<0.01	1.2	*
	Average	2.7	3.6	2.3
Fe_T	3/4	200	11.1	94
	3/5	260	7.1	97
	3/6	340	8.2	98
	Average	270	8.8	97
Fe_D	3/4	0.92	0.95	*
	3/5	0.91	0.65	29
	3/6	0.40	0.27	32
	Average	0.74	0.62	16
Zn	3/4	78	7.6	90
	3/5	96	4.9	95
	3/6	156	4.7	97
	Average	110	5.7	95
O/G	3/4	7	2	71
	3/5	11	4	64
	3/6	27	6	78
	Average	15	4	73
Phenolics	3/4	2.0	0.72	64
	3/5	0.88	0.44	50
	3/6	0.16	0.20	*
	Average	1.0	0.45	55

† *All concentrations are gross values*

†† *Date is the day the sample was composited except for settleable solids, O/G, and phenols. Settleable solids were grab sampled once per sampling day (i.e. 6:00 a.m. to 6:00 a.m.). O/G and phenolics were grab sampled three times per sampling day.*

††† *Settleable solids are reported in ml/l*

* *Percent removal not calculated because effluent concentration exceeded influent concentration.*

** *Samples exceeded recommended holding time due to rerouting of airline flight from Pittsburgh to Denver when Denver airport was closed due to blizzard.*

USSC has proposed changes to their National Pollutant Discharge Elimination System (NPDES) permit for interim and final effluent limitations. USSC reports that the proposed changes in interim limitations are being requested "*to more accurately describe the quality of the current discharge.*" Proposed changes in final limitations are being requested because USSC believes that the installation of best practicable control technology (recycle of blast furnace process wastes) will not meet the existing permit limitations.[5] Comparison of USSC-proposed changes with NEIC monitoring results [Table 10] indicates that all parameters except average daily total suspended solids were within the interim limitations proposed to be effective until the completion of recycle facilities. Ammonia, phenolics and total cyanide loads were 47%, 14% and 75%, respectively, of the daily average proposed limitations. Comparison of NEIC data with proposed final limitations shows that, again, only total suspended solids limits were exceeded. The basis for the substantial increase in the USSC-proposed interim and final limitations for ammonia is unknown.

OUTFALL 211

Slag from blast furnace No. 4 is granulated and sold for use primarily as a road base material. Outfall 211, the overflow from the slag pit, is a continuous discharge. During casting, molten slag flows to the slag pit from which it is intermittently removed by clam shell. The intermittent discharge of molten slag into the pit and removal of granulated slag causes a highly variable flow through outfall 211. Slag pit overflow is discharged untreated to the Monongahela River through outfall 011 [Fig. 1]. During NEIC monitoring, blast furnace No. 4 was operating at 84% of its capacity.

NEIC monitoring results [Tables 4, 5, 6] indicate that outfall 211 discharged a net average of 2,900 kg (6,600 lb)/day total suspended solids and 32 kg (70 lb)/day ammonia. Other pollutants monitored were

Table 10

COMPARISON OF USSC-PROPOSED LIMITATIONS AND NEIC SURVEY RESULTS
OUTFALL 111
USSC DUQUESNE

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
	Present to Completion of Facility[†],[††]							
TSS	1,412	3,106	4,236	9,318	1,900	4,200	2,600	5,700
NH_3-N	1,054	2,320	3,162	6,960	500	1,100	630	1,400
Phenols	96	211	288	633	13	29	21	48
CN_T	200	440	600	1,320	150	330	210	470
CN_A	-	-	-	-	86	190	130	290
Fe	-	-	-	-	180	390	230	500
Zn	-	-	-	-	140	300	180	390
	Completion of Facility to Expiration[†††]							
TSS	553	1,216	1,659	3,648	1,900	4,200	2,600	5,700
NH_3-N	1,323	2,910	3,969	8,730	510	1,100	640	1,400
Phenols	42.3	93	126.9	279	13	29	21	48
CN_T	-	-	-	-	150	330	210	470
CN_A	118	260	354	780	86	190	130	290
Fe	-	-	-	-	210	470	260	580
Zn	-	-	-	-	140	310	180	400

[†] *All loads are net except TSS which is gross.*
[††] *This refers to completion of recycle facilities.*
[†††] *All loads are gross values.*

discharged in negligible quantities. During three days of monitoring, daily flow ranged from 8,400 m^3/day (2.2 mgd) to 22,000 m^3/day (5.8 mgd) and averaged 16,000 m^3/day (4.3 mgd).

Comparison of USSC self-monitoring data with NEIC survey results [Table 11] indicates that USSC average total suspended solids and flow values are approximately 50% and 40% less, respectively, than NEIC values, while pH levels are greater than observed during the survey.

USSC has proposed effluent limitations for outfall 211. According to USSC, the proposed limits are intended to "*more accurately describe the quality of the current discharge.*"[5] USSC-proposed limitations are compared as follows with NEIC survey findings.

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS†	3,459	7,610	10,377	22,830	3,500	7,700	6,200	14,000
NH_3-N††	-	-	-	-	32	70	47	100

† *Gross values*
†† *Net values*

USSC has proposed that limitations be effective on outfall 211 only until the completion of facilities. It is assumed by NEIC that this refers to the completion of recycle facilities for blast furnace process wastewaters including slag pit overflow.

OUTFALL 011

Discharges from outfalls 111 and 211 combine with cooling water from the No. 6 blast furnace and discharge to the river through outfall 011 [Fig. 1]. During maximum production, process wastewaters from No. 1 and 3 blast furnaces discharge to outfall 011 through outfall 111; however, during the NEIC survey these furnaces were not operating. With

Table 11

COMPARISON OF USSC SELF-MONITORING DATA AND NEIC SURVEY DATA[†]
OUTFALL 211
USSC DUQUESNE

Parameter	USSC	NEIC[††]		
	Concentration mg/l	Concentration mg/l	Load	
			kg/day	lb/day
TSS	74	145	2,900	6,600
NH_3-N	-	2.1	32	70
CN_T	-	0.13	2.0	4.4
CN_A	-	0.02	0.20	0.44
O/G	-	1	20	50
Phenolics	-	0	0	0
Fe_T	-	0.6	11	24
Fe_D	-	0.02	0.4	1.0
Zn	-	0.01	0.16	0.35

Field Measurements	USSC	NEIC
pH Range	8.1-11.0	5.2-7.3
Temperature Range °C	-	20-48
Settleable Solids Range ml/l	-	<0.1
Average Flow m^3/day x 10^3	12	16
mgd	3.1	4.3

[†] *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake). USSC self-monitoring data is for the period January-October 1975.*

[††] *NEIC data, excluding field measurements, are average of three consecutive days of monitoring from March 3-6, 1976.*

the exception of blast furnace process wastewaters (outfall 111), all wastewaters from outfall 011 are discharged untreated.

USSC officials reported, and NEIC dye testing confirmed, that outfalls 011 and 012 are interconnected [Fig. 1]. USSC personnel indicated that due to the elevation differential, a limited flow of wastewater from the 011 sewer is discharged through outfall 012. Testing by NEIC showed that dye introduced at outfalls 111 and 211 is completely mixed in the wastewater flow by the time it reaches outfall 011, a travel time of approximately four minutes. According to plans supplied by USSC, the interconnection between outfalls 011 and 012 is located within 45 m (150 ft) of the terminus of both outfalls. It is reasonable to conclude that dye introduced at outfalls 111 and 211 is completely mixed by the time it reaches the interconnection point. Moreover, the dye concentration at the terminus of outfall 011 was used to calculate the flow in the 011 sewer upstream of its connection with outfall 012. In this report, flows indicated for outfall 011 are actual measured flows just upsewer of the connection with outfall 012.

During NEIC sampling, blast furnaces 4 and 6 were operating at 92% of their combined capacity. Based on production capacity, with all four furnaces operating at capacity, process wastes from No. 4 and 6 blast furnaces represented about 61% of the maximum discharge to outfall 011. Comparison of daily average loads discharged from outfall 011 with the sum of loads from outfalls 111 and 211 [Table 12] should provide relatively close correlation inasmuch as the parameters monitored are primarily pollutants present in blast furnace process wastewaters.

The comparison, however, does not indicate a close correlation. Total suspended solids and ammonia loads discharged at outfall 011 were 42% and 29% less, respectively, than the sum of loads from outfalls 111 and 211. On the other hand, total cyanide and amenable cyanide loads at outfall 011 were 270% and 400% greater, respectively, than the sum of

Table 12

COMPARISON OF DAILY AVERAGE POLLUTANT LOADS AND FIELD MEASUREMENTS OUTFALLS 111 PLUS 211 vs. OUTFALL 011 USSC DUQUESNE

Parameter	Outfall 111 plus 211		Outfall 011	
	kg/day	lb/day	kg/day	lb/day
TSS	4,000	9,100	2,400	5,300
NH_3-N	530	1,200	390	850
CN_T	150	330	550	1,200
CN_A	86	190	430	930
O/G	30	80	0	0
Phenolics	13	29	12	27
Fe_T	190	410	300	660
Fe_D	15	33	15	33
Zn	140	300	190	410

Field Measurements	Outfall 111 plus 211	Outfall 011
pH Range	5.2-7.4	6.6-8.3
Temperature Range °C	20-50	19-26
Settleable Solids Range (ml/l)	<0.1-37	<0.1-0.2
Average Flow (m^3/day x 10^3)	40	190††
(mgd)	10.7	51

† *All pollutant loads are net values*

†† *Flow present in Outfall 011 sewer upsewer of interconnection with outfall 012.*

loads from outfalls 111 and 211. Similarly, total iron and zinc loads were significantly greater at outfall 011.

The difference in oil/grease loads is only apparent because the concentration change was 1 mg/l (i.e. within the accuracy of the test). The substantial increase in cyanide, iron and zinc indicates that process wastewaters in addition to outfalls 111 and 211 or contaminated cooling waters are reaching outfall 011. Average suspended solids loads [Table 12] as well as other daily pollutant loads [Table 4] decreased significantly for reasons unknown to NEIC. The decrease in ammonia loads occurred only on March 4 of the three days sampled, again for reasons unknown to NEIC.

Date (Mar.)	NH_3-N Loads			
	111 + 211		011	
	kg/day	lb/day	kg/day	lb/day
4	660	1,500	230	500
5	520	1,200	500	1,100
6	440	950	430	960

USSC self-monitoring data [Table 7] indicates that instantaneous measured flows averaged 108,000 m^3/day (28.5 mgd), 44% less than measured during the survey. NEIC flow values for outfall 011 include that portion of the flow discharged through outfall 012 [Fig. 1]. USSC has proposed that outfall 011 not be limited for any parameters except pH and that the pH not be less than 6.0.

OUTFALL 112

The No. 1 blast furnace granulated slag pit overflow (outfall 112) discharges untreated wastewater to outfall 012. During the survey, blast furnace No. 1 was not operating, outfall 112 was inactive and sampling was not conducted. USSC reports a flow of 400 m^3/day (0.1 mgd), pH of 8.3 to 11.1 and total suspended solids concentrations of

≤30 mg/l [Table 7]. USSC has proposed gross limitations for total suspended solids as follows:

Daily average	50 mg/l
Daily maximum	150 mg/l

OUTFALL 012

Once-through cooling water from the oxygen plant and overflow from the blast furnace No. 1 granulated slag pit (outfall 112) is discharged to main outfall 012. In addition, a portion of the flow from the outfall 011 sewer is discharged through outfall 012 [Fig. 1]. During the survey, blast furnace No. 1 was not operating and there was no discharge from the granulated slag pit (outfall 112). The oxygen plant operated throughout NEIC sampling, supplying oxygen to the BOP shop. The BOP shop production averaged 78% of its rated capacity during the survey.

Outfall 012 was monitored by NEIC upsewer of its interconnection with outfall 011. In this report, monitoring results for outfall 012 refer to characteristics of the wastewater upsewer of the interconnection with outfall 011. Sampling results [Tables 4, 5, 6] indicated an average flow of 150,000 m^3/day (41 mgd) and a pH range of 6.7 to 8.3. Temperature ranged from 18 to 22°C while intake water temperature was 11.5 to 16.5°C. The average net total suspended solids and oil/grease loads discharged were:

Parameter	mg/l	kg/day	lb/day
TSS	3	440	970
O/G	1	200	300

USSC self-monitoring data [Table 7] shows an average flow of 129,000 m^3/day (34.1 mgd) ranged in temperature from 17 to 70°C. The pH ranged from 7.3 to 11. USSC did not monitor for total suspended solids or oil/grease.

USSC has proposed that outfall 012 not be limited for any parameters except pH (i.e., shall not be less than 6.0) and that monitoring for flow and temperature be conducted monthly until "*the completion of facilities.*" Monitoring of amenable cyanide is also proposed for the period following completion of facilities until expiration of the NPDES permit.[5]

OUTFALL 013

Cooling water from No. 1, 3 and 4 blast furnaces is discharged to outfall 013 along with filter backwash and settled sludge from the USSC water treatment plant. Outfall 013 is a combined sewer containing wastewater from the City of Duquesne. City flow was measured and sampled as it entered USSC property. Water treatment plant discharges were intermittent and were sampled where they enter the 013 sewer. During the survey, blast furnaces 1 and 3 were not operating. No. 4 blast furnace production during monitoring was 36% of the rated capacity of No. 1, 3 and 4 furnaces combined.

Sampling of the City wastewater indicated the presence of sanitary sewage. Survey results [Tables 4, 5, 6] showed the flow averaged 4,400 m^3/day (1.2 mgd). Total suspended solids, ammonia and oil/grease were present in the following average daily concentrations and loads:

Parameter	mg/l	kg/day	lb/day
TSS	130	590	1,300
NH_3-N	4.8	22	48
O/G	130	420	910

Of nine grab samples collected for oil and grease, seven had concentrations less than 44 mg/l, one was 380 mg/l and the other 640 mg/l. In addition, field measurements for pH were 11.4 and 11.5 on two occasions while 22 other readings ranged from 6.9 to 8.4. These findings show that industrial wastes are intermittently discharged to the sewer.

A single grab sample of City wastewater was collected on March 4, 1976 for organic analysis. Results indicated the presence of the following organic compounds:

Compound	Concentration (mg/l)
Alkanes, 8 species, C_9 to C_{14}	0.060†
Alpha terpineol	0.230
Caffeine	0.030
Dibutylphthalate	0.022
Diethylphthalate	0.008
Diisobutylphthalate	0.015
Hexadecanol	0.020
Isoborneol	0.020†
Octadecanol	0.033
Para-Cresol	0.015
Tetradecanol	0.045

† *Approximate concentration*

Outfall 013 was sampled at the river downsewer from all USSC inputs. The City contribution and the intake contribution was subtracted from the results and the net USSC input was computed [Tables 4, 5, 6]. Comparison of USSC and City contributions [Table 13] indicated that USSC flow averaged 32,000 m^3/day (8.5 mgd), 88% of the total flow through outfall 013. In addition, the comparison indicates that the major pollutant inputs by USSC are total suspended solids and iron. On a net concentration basis, USSC wastewater averaged 75 mg/l total suspended solids and 2.4 mg/l total iron.

A grab sample for organic compounds was collected from outfall 013 on March 4, 1976. A single organic compound, alpha terpineol, was present at a concentration of 0.030 mg/l. As previously tabulated, alpha terpineol was present in the City of Duquesne wastewater at a

Table 13

COMPARISON OF AVERAGE USSC AND CITY OF DUQUESNE LOADS†
DISCHARGED TO OUTFALL 013
USSC DUQUESNE
March 3-6, 1976

Parameter	USSC		City of Duquesne	
	kg/day	lb/day	kg/day	lb/day
TSS	3,300	7,300††	590	1,300
NH_3-N	†††	-	22	48
CN_T	†††	-	0.31	0.69
CN_A	†††	-	0.02	0.05
O/G	30	60	420	910
Phenolics	†††	-	0.11	0.24
Fe_T	71	160	8.9	19
Fe_D	4.5	9.6	0.74	1.6
Zn	2.9	6.1	0.83	1.8
Flow m^3/day	32,000		4,400	
mgd	8.5		1.2	

† *USSC loads are net values [i.e. gross-(intake + City)]. City loads are gross.*

†† *Includes 1,000 kg/day (2,400 lb/day) from the USSC water treatment plant.*

††† *Discharge load was less than intake load.*

concentration of 0.230 mg/l. Instantaneous flows measured at the time the organic samples were collected indicated the City was discharging 3,800 m^3/day (1.0 mgd) and the total flow from outfall 013 was 32,000 m^3/day (8.4 mgd). Mass loading rates at these flows indicate that 90% of the alpha terpineol originated from unknown sources in the City of Duquesne.

Plant personnel indicated that previous to the NEIC survey, USSC did not monitor City input to outfall 013. Therefore, self-monitoring data [Table 7] is the result of sampling the combined discharge.

The USSC water treatment plant treats an estimated 6,100 m^3/day (1.6 mgd) for use in the plant boilers [Appendix A]. Chemicals including lime, soda ash and sodium aluminate, are added, mixed and the solids are allowed to settle on a batch basis. Clear water is then decanted, filtered and distributed. Solids removed during settling and filtration are returned to the receiving water contrary to EPA policy.[6] Four settling tanks of approximately 2,040 m^3 (539,000 gal) capacity each were in use during the survey. According to USSC plant personnel, 570 m^3 (150,000 gal) of settled sludge is discharged to outfall 013 an average of once per week from each of the four tanks. The average daily solids blowdown discharge is therefore 325 m^3 (86,000 gal). Plant personnel reported that an average of two filters are backwashed daily, resulting in a discharge of 78.5 m^3 (20,750 gal)/filter or 157 m^3 (41,500 gal)/day.

Solids blowdown and filter backwash discharges were each sampled by NEIC. The duration of each discharge was 15 to 30 minutes and samples consisted of equal-volume portions collected at 2- to 3-minute intervals. Samples were analyzed for settleable and suspended solids with the following results:

Parameter		Filter Backwash†	Solids Blowdown
Settleable solids	(ml/l)	1.2	29
TSS	(mg/l)	190	3,200
	(kg/day††)	30	1,000
	(lb/day)	66	2,300

† *Average of two samples. Individual results were: settleable solids 1.0 and 1.5 ml/l, TSS 160 and 220 mg/l.*

†† *Loads are gross values and are based on average daily filter backwash discharge of 157 m^3 (41,500 gal) and average daily solids blowdown discharge of 325 m^3 (86,000 gal).*

The solids blowdown discharge accounted for approximately 97% of the suspended solids from the water treatment and occurred for a 20 to 30 minute period resulting in a flow of 27,000 to 41,000 m^3/day (7.2 to 11 mgd). Instantaneous flow readings at the terminus of outfall 013 did not indicate flow changes of this magnitude. Therefore, outfall 013 monitoring results [Table 4] do not include the impact of water treatment plant discharges. Moreover the total suspended solids load from USSC sources to outfall 013 averaged 3,300 kg (7,300 lb)/day, approximately 32% of which was from the water treatment plant.

USSC has proposed that outfall 013 be limited only for pH ($\geq$6.0) and that monthly monitoring be required for flow and temperature.

OUTFALL 114

Approximately 90% of the steel production capacity at the Duquesne Plant is present in the BOP facilities. Process wastewaters from the BOP shop include gas cleaning flow from the rake classifier and gas cooling tower slurry. Following treatment, these wastewaters are discharged through outfall 114. During the NEIC survey, the BOP shop was operating at approximately 78% of its production capacity.

Process wastewaters are treated in a 25 m (85 ft) diameter by 2.6 m (8 ft 8 in) side water depth (SWD) gravity thickener. Polymer is added to enhance settling characteristics. Settled solids are continuously dewatered on drum-type vacuum filters and filtrate is returned to the thickener. There are three different sources of thickener influent, two of which are the result of BOP shop operations. The three sources are: gas cleaning flow from the rake classifier; gas cooling tower slurry; and bar mill scarfer electrostatic precipitator (ESP) flow. Each thickener influent source discharges continuously except the bar mill scarfer ESP.

NEIC monitoring results [Tables 4, 5, 6] indicate that the flow through outfall 114 ranged from 8,000 to 9,900 m^3/day (2.1 to 2.6 mgd) and averaged 8,700 m^3/day (2.3 mgd). The pH and temperature ranged from 10.8 to 11.7 and 34 to 45 °C, respectively. The main pollutants discharged were total suspended solids, total iron and fluoride. USSC self-monitoring data [Table 7] is compared with NEIC survey data in Table 14. Particularly notable is the difference in total suspended solids concentrations. NEIC survey results indicated net total suspended solids levels from 0 to 45 mg/l while USSC self-monitoring results of 19 samples ranged from 0 to 3,764 mg/l and averaged 225 mg/l, almost 10 times the average concentration observed during the survey.

The BOP thickener was evaluated for pollutant removal efficiency. Influent flows, except the bar mill scarfer ESP discharge, were sampled and composited on an equal-volume basis, while thickener effluent was composited on a flow-weighted basis. USSC officials indicated the flow from the bar mill scarfer ESP was only 40 to 80 liters (10 to 20 gal)/min, about 1% of the flow measured in outfall 114 during the survey. Flow from the two major influent lines to the thickener was estimated by NEIC. The gas cleaning flow from the rake classifier discharges into the thickener center well by gravity. NEIC determined the slope and size of the pipeline and measured the depth of flow every time a sample was collected. From this information an estimated flow was calculated.

Table 14

COMPARISON OF USSC SELF-MONITORING AND NEIC SURVEY DATA[†]
OUTFALL 114
USSC DUQUESNE

Parameter	USSC	NEIC[††]		
	Concentration mg/l	Concentration mg/l	Load kg/day	Load lb/day
TSS	225	23	190	410
NH_3-N	-	0.47	4.0	9.0
CN_T	-	0.01	0.06	0.13
CN_A	-	0	0	0
O/G	-	0	0	0
Phenolics	-	0.005	0.04	0.08
Fe_T	-	8.6	75	170
Fe_D	0.074	0.14	1.4	3.0
Zn	-	0.08	0.65	1.4
Fl	-	8.7	76	170

Field Measurements	USSC	NEIC
pH Range	9.0-12.1	10.8-11.7
Temperature Range °C	-	35-45
Settleable Solids Range ml/l	-	<0.1-0.1
Average Flow $m^3/day \times 10^3$	10	8.7
mgd	2.7	2.3

[†] *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake). USSC self-monitoring data is for the period January-October 1975.*

[††] *NEIC data, excluding field measurements, are average of three consecutive days of monitoring from March 3-6, 1976.*

Gas cooling tower slurry was pumped continuously to the thickener by a single centrifugal pump. The pumping rate was estimated based on pump, piping, and elevation information gathered. Estimated average daily influent flow from both sources is compared below with the measured effluent flow:

Date	Rake Classifier m^3/day	Rake Classifier mgd	Gas Cooling Tower Slurry m^3/day	Gas Cooling Tower Slurry mgd	Total Estimated Influent m^3/day	Total Estimated Influent mgd	Measured Effluent m^3/day	Measured Effluent mgd
3/4	3,200	0.85	2,350	0.62	5,600	1.47	7,900	2.1
3/5	3,400	0.90	2,350	0.62	5,800	1.52	9,800	2.6
3/6	3,000	0.79	2,350	0.62	5,300	1.41	8,300	2.2

The estimated total influent flow averaged approximately 35% less than the measured effluent flow. For purposes of calculating pollutant loads, influent flow from each of the two sources was adjusted upward equivalent to the sources' percentage of the total flow. Based on the above figures, the rake classifier accounted for an average 58% of the total influent flow and gas cooling tower slurry 42%, resulting in adjusted flows of:

Date	Rake Classifier m^3/day	Rake Classifier mgd	Gas Cooling Tower Slurry m^3/day	Gas Cooling Tower Slurry mgd	Total Flow m^3/day	Total Flow mgd
3/4	4,600	1.2	3,350	0.9	8,950	2.1
3/5	5,700	1.5	4,150	1.1	9,850	2.6
3/6	4,800	1.3	3,500	0.9	9,300	2.2

Influent sampling [Tables 15, 16, 17] indicated that TSS and total iron are the major pollutants discharged to the BOP thickener. Influent total suspended solids and total iron concentrations averaged greater than 5,000 mg/l and 400 mg/l, respectively.

Table 15

FIELD MEASUREMENTS AND ANALYTICAL DATA
BOP THICKENER INFLUENTS
USSC DUQUESNE
March 3-6, 1976

Station Description	Date†	Flow††		pH Range	Temp. Range (°C)	Settleable Solids (ml/l)	Gross / Net	TSS			Ammonia			Total Cyanide			Amenable Cyanide		
		m^3/day x 10^3	mgd					mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Gas cleaning flow from rake classifier	3/4	4.6	1.2	10.9-11.4	32-70	70	G	1,100	5,000	11,000	0.61	2.8	6.1	0.02	0.09	0.2	0.01*	0.04	0.10
	3/5	5.7	1.5	6.9-11.4	35-64	60	G	9,700	55,000	120,000	0.83	4.7	10	0.17	0.97	2.1	0.01*	0.06	0.1
	3/6	4.8	1.3	6.8-11.1	23-64	29	G	4,200	21,000	46,000	0.53	2.6	5.7	0.14	0.69	1.5	0.02	0.1	0.2
	Average	5.0	1.3																
Gas cooling tower slurry	3/4	3.4	0.9	6.3-7.4	37-55	40	G	4,920	17,000	37,000	0.86	2.9	6.5	0.14	0.48	1.1	0.01*	0.03	0.08
	3/5	4.2	1.1	5.3-11.1	34-62	55	G	6,580**	27,000	60,000	1.5	6.2	14	0.15	0.62	1.4	0.02*	0.08	0.2
	3/6	3.5	0.9	6.0-9.2	23-50	80	G	8,230	28,000	62,000	0.99	3.4	7.4	0.25	0.85	1.9	0.01	0.03	0.08
	Average	3.7	1.0																
Total of influents	3/4	8.0	2.1						22,000	48,000		5.7	13		0.57	1.3		0.07	0.18
	3/5	9.9	2.6						82,000	180,000		11	24		1.6	3.5		0.14	0.3
	3/6	8.3	2.2						49,000	108,000		6.0	13		1.5	3.4		0.13	0.28
	Average	8.7	2.3						51,000	112,000		7.6	17		1.2	2.7		0.11	0.25

† *Date is the day the samples was composited (i.e., 24-hour composite 0600 March 3 to 0600 March 4 was dated March 4).*

†† *Flows are estimate of average flow during sampling day and are based on theoretical calculations using known data (i.e., water depth and slope of gravity lines, pump size and total pumping head for pressure line).*

* *Sample was analyzed after the recommended holding time because commercial aircraft from Pittsburgh to Denver was rerouted due to blizzard conditions at Denver. Tabulated result represents minimum value due to possible deterioration of sample.*

** *Sample exceeded maximum holding time and was not analyzed. Concentration tabulated is average of the 3/4 and 3/6 results.*

Table 16

OIL AND GREASE AND PHENOLICS DATA[†]
BOP THICKENER INFLUENTS
USSC DUQUESNE
March 3-6, 1976

Station Description	Date	Time	Average Flow[††]		Oil and Grease[†††]			Phenolics		
			m^3/day x 10^3	mgd	mg/l	kg/day	lb/day	µg/l	kg/day	lb/day
Gas cleaning flow from Rake classifier	3/3	1530	4.6	1.2	<1	<5	<10	7	0.03	0.07
	3/3	2010	4.6	1.2	<1	<5	<10	<5	<0.02	<0.05
	3/4	0115	4.6	1.2	*			<5	<0.02	<0.05
	Gross Daily Average				<1	<5	<10	<5	<0.02	<0.05
	3/4	1525	5.7	1.5	<1	<6	<10	5	0.03	0.06
	3/4	1900	5.7	1.5	<1	<6	<10	9	0.05	0.1
	3/5	0100	5.7	1.5	1	6	10	5	0.03	0.06
	Gross Daily Average				<1	<6	<10	6	0.04	0.07
	3/5	1515	4.8	1.3	7	30	80	9	0.04	0.1
	3/5	1920	4.8	1.3	4	20	40	*	-	-
	3/6	0100	4.8	1.3	5	20	50	*	-	-
	Gross Daily Average				5	20	50	3	0.01	0.03
Gas cooling tower slurry	3/3	1535	3.4	0.9	2	7	20	<5	<0.02	<0.04
	3/3	1925	3.4	0.9	<1	<3	<8	<5	<0.02	<0.04
	3/4	0125	3.4	0.9	<1	<3	<8	<5	<0.02	<0.04
	Gross Daily Average				<1	<3	<8	<5	<0.02	<0.02
	3/4	1535	4.2	1.1	1	4	9	8	0.03	0.07
	3/4	1910	4.2	1.1	1	4	9	6	0.02	0.06
	3/5	0105	4.2	1.1	23	96	210	*	-	-
	Gross Daily Average				8	35	76	5	0.02	0.04
	3/5	1520	3.5	0.9	6	20	50	20	0.068	0.15
	3/5	1925	3.5	0.9	6	20	50	16	0.054	0.12
	3/6	0105	3.5	0.9	6	20	50	24	0.082	0.18
	Gross Daily Average				6	20	50	20	0.068	0.15
Total of influents	3/4		8.0	2.1		<8	<18		<0.04	<0.07
	3/5		9.9	2.6		35	76		0.06	0.11
	3/6		8.3	2.2		40	100		0.08	0.18
	Average		8.7	2.3		25	59		0.05	0.1

[†] *All data are based on grab samples. Sampling day is from 6:00 a.m. to 6:00 a.m.*

[††] *Flows are estimate of average flow during sampling day and are based on theoretical calculations using known data (i.e. water depth and slope of gravity lines, pump size and total pumping head for pressure line).*

[†††] *Freon extractable material.*

* *Sample bottle was broken in shipment.*

** *Sample not analyzed because holding time was exceeded.*

Table 17

METALS AND FLUORIDE DATA
BOP THICKENER INFLUENTS
USSC DUQUESNE
March 3-6, 1976

Station Description	Date[†]	Flow[††]		Gross/Net	Total Iron			Dissolved Iron			Zinc			Fluoride		
		m^3/day x 10^3	mgd		mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
Gas cleaning flow from rake classifier	3/4	4.6	1.2	G	190	860	1,900	0.07	0.3	0.7	0.91	4.1	9.1	8.0	36	80
	3/5	5.7	1.5	G	620	3,500	7,800	0.04	0.2	0.5	3.8	22	48	9.6	54	120
	3/6	4.8	1.3	G	500	2,500	5,400	0.06	0.3	0.6	2.0	10	22	9.2	45	100
	Average	5.0	1.3													
Gas cooling tower slurry	3/4	3.4	0.9	G	780	2,700	5,900	0.04	0.1	0.3	3.0	10	23	20	68	150
	3/5	4.2	1.1	G	920[†††]	3,800	8,400	0.04[†††]	0.2	0.4	4.0[†††]	17	37	17	71	160
	3/6	3.5	0.9	G	1,060	3,600	8,000	0.05	0.2	0.4	5.1	17	38	22	75	170
	Average	3.7	1.0													
Total of influents	3/4	8.0	2.1	G		3,600	7,800		0.4	1.0		14	32		100	230
	3/5	9.9	2.6	G		7,300	16,000		0.4	0.9		39	85		120	280
	3/6	8.3	2.2	G		6,100	13,000		0.5	1.0		27	60		120	270
	Average	8.7	2.3			5,700	12,000		0.4	1.0		27	59		110	260

[†] *Date is the day the samples was composited (i.e., 24-hour composite 0600 March 3 to 0600 March 4 was dated March 4).*

[††] *Flows are estimate of average flow during sampling day and are based on theoretical calculations using known data (i.e., water depth and slope of gravity lines, pump size and total pumping head for pressure line).*

[†††] *Sample was not shipped to Denver. Concentration tabulated is average of the 3/4 and 3/6 results.*

Based on influent and effluent loads the thickener efficiency was 95% or greater for TSS, settleable solids, total iron and zinc [Table 18]. In addition, the thickener removed an average of 81% of the total cyanide. These efficiencies are only rough estimates however because thickener influents were equal-volume composited.

USSC has proposed that interim effluent limitations in the NPDES permit be changed "*to more accurately reflect the quality of the current discharge.*" In addition, USSC has proposed that final limitations be the same as initial limitations because USSC believes that "*no additional control should be required for the term of the permit.*"[5] USSC has proposed gross limitations for total suspended solids, dissolved iron and pH. The proposed limitations compared to NEIC survey findings are listed below:

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	4,101	9,022	12,303	27,066	470	1,000	550	1,200
Fe_T	-	-	-	-	88	190	110	230
Fe_D	-	-	7 mg/l		0.16 mg/l		0.35 mg/l	
Fl	-	-	-	-	77	170	92	200
pH	Shall not be less than 6.0				Range 10.8-11.7			

The daily average and daily maximum suspended solids loads discharged were only 11% and 4%, respectively, of the proposed limitation, despite the fact that the BOP shop was producing at 78% of its production capacity.

OUTFALL 014

Cooling water from the BOP shop is discharged untreated along with effluent from the BOP thickener (outfall 114) to the Monongahela River

Table 18

TREATMENT EFFICIENCY OF BOP THICKENER
USSC - DUQUESNE
March 3-6, 1976

Parameter	Date	Load[†]				% Removal
		Influent		Effluent		
		kg/day	lb/day	kg/day	lb/day	
TSS	3/4	22,000	48,000	550	1,200	97.5
	3/5	82,000	180,000	490	1,100	99.4
	3/6	49,000	108,000	360	790	99.3
	Average	51,000	112,000	470	1,000	99.1
Settleable Solids[†††] Range	3/4	40-70		0.1		
	3/5	55-60		<0.1		
	3/6	29-80		<0.1		
	Average	56		<0.1		99.8
NH_3-N	3/4	5.7	13	6.2	14	†††
	3/5	11	24	7.2	16	33
	3/6	6.0	13	7.7	17	†††
	Average	7.6	17	7.0	16	6
CN_T	3/4	0.57	1.3	0.16	0.35	73
	3/5	1.6	3.5	0.40	0.88	75
	3/6	1.5	3.4	0.08	0.18	95
	Average	1.2	2.7	0.21	0.47	81
CN_A	3/4	0.07	0.18	<0.08	<0.18	0
	3/5	0.14	0.3	0.20	0.44	†††
	3/6	0.13	0.28	<0.08	<0.18	36
	Average	0.11	0.25	<0.12	<0.27	†††
Fe_T	3/4	3,600	7,800	100	220	97
	3/5	7,300	16,000	110	230	99
	3/6	6,100	13,000	55	120	99
	Average	5,700	12,000	88	190	98
Fe_D	3/4	0.4	1.0	0.56	1.2	†††
	3/5	0.4	0.9	3.5	7.7	†††
	3/6	0.5	1.0	0.41	0.90	10
	Average	0.4	1.0	1.5	3.3	†††
Zn	3/4	14	32	1.3	2.8	91
	3/5	39	85	1.2	2.6	97
	3/6	27	60	1.3	2.9	95
	Average	27	59	1.3	2.8	95
Fl	3/4	100	230	71	160	30
	3/5	120	280	92	200	29
	3/6	120	270	68	150	44
	Average	110	260	77	170	35
O/G	3/4	<8	<18	<10	<20	†††
	3/5	35	76	20	50	34
	3/6	40	100	50	100	0
	Average	25	59	<20	<50	15
Phenolics	3/4	<0.04	<0.07	0.07	0.1	†††
	3/5	0.06	0.11	0.08	0.2	†††
	3/6	0.08	0.18	0.10	0.22	†††
	Average	0.05	0.1	0.08	0.17	†††

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† *All loads are gross values*

†† *Settleable solids are reported in ml/l. The range of settleable solids refers to the results found in the three influents sampled.*

††† *Effluent load exceeded influent load.*

through outfall 014. As noted earlier, BOP shop production was 78% of rated capacity during the survey.

Monitoring results [Tables 4, 5, 6] indicated that flow averaged 36,000 m^3/day (9.6 mgd) and ranged from 35,000 to 39,000 m^3/day (9.2 to 10.4 mgd). The pH and temperature ranged from 10.0 to 11.4 and 22 to 55°C, respectively. Settleable solids ranged from 8 to 35 ml/l and averaged 18 ml/l. Suspended solids and total iron loads averaged 2,000 kg/day (4,400 lb/day) and 125 kg/day (270 lb/day), respectively. Of additional significance was the elevated pH of the outfall 014 discharge.

Comparison of NEIC monitoring results for outfalls 114 and 014 [Table 19] show the cooling water contained average suspended solids and total iron loads of 1,800 kg (4,000 lb)/day and 50 kg (100 lb)/day, respectively. The BOP shop cooling water therefore is the major source of suspended solids in outfall 014 contributing approximately 10 times the load discharged from the BOP thickener (outfall 114). Settleable solids in outfall 014 were all derived from cooling water. In addition, the BOP shop cooling water contributed 37% of the total iron load discharged through outfall 014. Although the pH of outfall 014 was less than that of outfall 114, it appears that BOP shop cooling water, which accounts for 81% of the flow from outfall 014, is also elevated in pH.

USSC conducts limited self-monitoring of outfall 014. Flow, temperature and pH are measured and results [Table 7] are similar to NEIC findings. USSC has proposed that the pH of outfall 014 not be less than 6.0.

PRIMARY MILL SCALE PITS

The 21-, 36- and 46-inch primary rolling mills are housed in a common building and discharge to outfall 015. Direct contact cooling water removes mill scale from the heated steel pieces and can be

Table 19

COMPARISON OF NEIC MONITORING RESULTS[†]
OUTFALL 114 vs. OUTFALL 014
USSC DUQUESNE
March 3-6, 1976

Parameter	Outfall 114			Outfall 014		
	Concentration	Load		Concentration	Load	
	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
TSS	23	190	410	55	2,000	4,400
NH_3-N	0.47	4.0	9.0	0.06	2.1	4.7
CN_T	0.01	0.06	0.13	0	0	0
CN_A	0	0	0	0	0	0
O/G	0	0	0	1	30	100
Phenol	0.005	0.04	0.08	0	0	0
Fe_T	8.6	75	170	3.4	125	270
Fe_D	0.14	1.4	3.0	0.01	0.26	0.57
Zn	0.08	0.65	1.4	0.03	1.1	2.3
Fl	8.7	76	170	1.8	66	150

Field Measurements	Outfall 114	Outfall 014
pH Range	10.8-11.7	10.0-11.4
Temperature Range °C	35-45	22-55
Settleable Solids Range (ml/l)	<0.1-0.1	8-35
Average Flow (m^3/day x 10^3)	8.7	36
(mgd)	2.3	9.6

[†] *Excluding field measurements, results are net values and are average of three consecutive days of monitoring from March 3-6, 1976.*

contaminated by lubricating oils from the rolling machines. These process wastes from each mill are discharged to separate scale pits [Fig. 2]. The scale pits, designed to remove mill scale, have a theoretical detention time of approximately 30 minutes. Only the 21-inch mill scale pit is equipped for oil removal where a rope-type skimming device removes approximately 420 liters (110 gal)/week.[1]

NEIC monitored influent and effluent from each of the scale pits for three consecutive days, February 26-29, 1976. During monitoring, primary mill production averaged 3,651 m. tons (4,016 tons)/day,[1] 90% of its rated capacity of 4,040 m. tons (4,445 tons)/day.

Flow was measured using the dye dilution technique [Appendix C]. Results [Table 20] indicate that daily flow averaged 24,000 m^3/day (6.3 mgd), 19,000 m^3/day (5.1 mgd) and 52,000 m^3/day (13.7 mgd), respectively, through the 21-, 36- and 46-inch mill scale pits. Samples for total suspended solids and metals were composited on a flow-weighted basis. Sampling results [Tables 20, 21] indicate that the scale pits discharged low net quantities of TSS and metals. Moreover, there was no net increase above intake water values in any of the pollutants except oil/grease. However, USSC reports that an average monthly total of 3,714 m. tons (4,085 tons) of scale were removed from the scale pits during the period January to November 1975.[1] This was an average of 124 m. tons (136 tons)/day. Assuming scale was distributed proportional to flow, this would amount to a net concentration of 1,300 mg/l of suspended solids. NEIC findings showed suspended solids and total iron concentrations essentially that of intake water. This indicates that the material picked up in the descaling step is heavy and is not suspended at the velocities experienced in the scale pit influent flumes - the location at which influent samples were collected. NEIC monitoring results further show that while the scale pits are well designed for scale removal, they are not necessarily effective for the removal of other suspended solids.

Table 20

TREATMENT EFFICIENCY OF PRIMARY MILL SCALE PITS
TSS AND METALS
USSC DUQUESNE
February 26-29, 1976

Station Description	Date†	Flow††		pH††† Range	Settleable Solids	Gross Net	TSS*			Total Iron			Dissolved Iron			Zinc		
		m^3/day x 10^3	mgd		ml/l		mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day	mg/l	kg/day	lb/day
21-Inch Mill Scale Pit																		
Influent	2/27	22	5.8	6.5-8.3	1.0	G	91			5.4			0.02			0.09		
Effluent	2/27	22	5.8	7.3-9.0	0.6	G	81	1,800	3,900	4.3	95	210	0.01	0.22	0.49	0.11	2.4	5.4
% Removal	2/27		-	-	40		11			20			50			**		
Influent	2/28	26	7.0	6.4-8.1	<0.1	G	65			5.4			0.17			0.1		
Effluent	2/28	26	7.0	7.4-9.6	<0.1	G	41	1,100	2,400	3.4	90	200	0.02	0.53	1.2	0.07	1.8	4.1
% Removal	2/28		-	-	0		27			37			88			36		
Influent	2/29	23	6.1	7.3-7.4	<0.1	G	17			2.2			0.02			0.05		
Effluent	2/29	23	6.1	7.6-9.6	<0.1	G	40	920	2,000	2.3	53	120	0.03	0.69	1.5	0.05	1.4	3.0
% Removal	2/29		-	-	0		**			**			**			**		
Average % Removal					13		13			19			46			12		
36-Inch Mill Scale Pit																		
Influent	2/27	18	4.7	6.7-8.8	0.2	G	85			4.6			0.02			0.09		
Effluent	2/27	18	4.7	7.7-8.7	0.4	G	90	1,600	3,500	4.7	83	180	0.02	0.36	0.78	0.09	1.6	3.5
% Removal	2/27		-	-	**		**			**			0			0		
Influent	2/28	20	5.3	6.6-8.1	<0.1	G	49			4.2			<0.02			0.09		
Effluent	2/28	20	5.3	7.8-8.6	<0.1	G	49	990	2,200	4.2	85	190	0.12	2.4	5.3	0.08	1.6	3.5
% Removal	2/28		-	-	0		0			0			**			0		
Influent	2/29	20	5.2	7.2-7.9	0.1	G	49			3.0			0.02			0.07		
Effluent	2/29	20	5.2	7.6-8.4	<0.1	G	48	940	2,100	2.9	57	120	0.02	0.39	0.86	0.05	0.98	2.1
% Removal	2/29		-	-	0		2			3			0			29		
Average % Removal					0		1			1			0			13		
46-Inch Mill Scale Pit																		
Influent	2/27	47	12	6.9-10.5	0.1	G	110			12.7			0.04			0.08		
Effluent	2/27	47	12	8.8-10.5	0.5	G	110	5,200	11,000	10.4	490	1,100	0.02	0.94	2.1	0.07	3.3	7.2
% Removal	2/27		-	-	**		0			18			50			12		
Influent	2/28	59	16	6.6-9.7	<0.1	G	83			12.3			0.04			0.08		
Effluent	2/28	59	16	8.8-10.5	<0.1	G	80	4,700	10,000	7.9	470	1,000	<0.02	<1.2	<2.6	0.08	3.3	7.2
% Removal	2/28		-	-	0		4			36			50			12		
Influent	2/29	51	13	7.2-10.8	2.2	G	65			4.8			0.02			0.08		
Effluent	2/29	51	13	8.2-11.0	2.2	G	53	2,700	5,900	5.0	250	560	<0.02	<1.0	<2.2	0.08	4.7	10
% Removal	2/29		-	-	0		18			**			0			0		
Average % Removal					0		7			18			33			4		
Total of Scale Pit Effluents	2/27	87	22.5			G		8,600	18,000		670	1,500		1.5	3.4		7.3	16
	2/28	105	28.3			G		6,800	15,000		640	1,400		4.4	6.5		8.1	18
	2/29	94	24.3			G		4,600	10,000		360	800		1.2	2.4		6.0	13
	2/27					N		2,200	4,000		540	1,200		**	-		1.3	3
	2/28					N		**	-		460	1,000		3.1	4.1		0.6	2
	2/29					N		2,100	4,500		260	580		0.3	0.4		**	-
	Average	95	25					1,400	2,800		420	930		1.1	1.5		0.6	2

† Date is the day the sample was composited (i.e., 24-hour composite 0600 September 27 to 0600 September 28 was dated September 28).
†† Daily average flows are average of eight instantaneous flows during 24-hour sampling period.
††† The temperature of influent and effluent from each scale pit was measured every three hours. All readings ranged from 11.0-21.0°C in the influent to the 46-inch Mill Scale Pit, February 28 at 1035 hours.
* Only effluent loads were calculated.
** Effluent concentration exceeded influent concentration.

Table 21

TREATMENT EFFICIENCY OF PRIMARY MILL SCALE PITS
OIL AND GREASE
USSC DUQUESNE
February 26-29, 1976

Station Description	Date	Time†	Instantaneous Flow		Influent		Effluent		
			m³/day	mgd	mg/l		mg/l	kg/day	lb/day
21-Inch Mill Scale Pit	2/26	1630	21	5.4	3		6	100	300
	2/26	1935	23	6.1	4		11	250	560
	2/27	0140	23	6.0	5		5	100	300
						Average	7	200	400
	2/27	1620	22	5.8	6		5	100	200
	2/27	1905	23	6.1	5		8	200	400
	2/28	0055	22	5.9	5		3	70	100
						Average	5	100	200
	2/28	1555	26	6.9	<1		2	50	100
	2/28	1820	23	6.0	1		3	70	100
	2/29	0010	23	6.1	2		4	90	200
						Average	3	70	100
36-Inch Mill Scale Pit	2/26	1648	18	4.6	4		4	70	200
	2/26	2010	18	4.8	5		5	90	200
	2/27	0145	17	4.6	5		4	70	150
						Average	4	80	180
	2/27	1630	21	5.5	3		3	60	100
	2/27	1915	21	5.7	4		4	90	200
	2/28	0105	19	5.0	3		5	100	200
						Average	4	100	200
	2/28	1610	22	5.7	4		2	40	100
	2/28	1825	18	4.8	5		2	40	80
	2/29	0020	19	5.0	2		3	60	100
						Average	2	50	90
46-Inch Mill Scale Pit	2/26	1715	43	11	6		4	200	400
	2/26	2030	36	9.6	5		5	200	400
	2/27	0200	44	12	5		4	200	400
						Average	4	200	400
	2/27	1640	65	17	4		1	70	100
	2/27	1930	41	11	2		3	100	300
	2/28	0120	56	15	3		4	200	500
						Average	3	100	300
	2/28	1620	58	15	4		<1	<60	<100
	2/28	1840	36	9.6	1		1	40	80
	2/29	0035	37	9.7	1		<1	<40	<80
						Average	<1	<50	<90
Total of Scale Pit Effluents	2/27							480	980
	2/28							300	700
	2/29							120	190
						Average		300	620

† *Time indicated is time at which effluent samples was collected. Influent was sampled within an average of 20 minutes of time effluent samples was collected.*

Field measurements [Table 20] show that the effluent pH from the 21-and 46-inch scale pits as 9.0. The effluents from the 21- and 46-inch mill scale pits had a maximum pH of 9.6 and 11.0, respectively. USSC self-monitoring data reports a maximum pH of 11.6 in outfall 015 [Table 7].

Oil/grease concentrations [Table 21] show that the scale pits were ineffective in removing oil and grease. Results further show that oil removal facilities at the 21-inch mill scale pit were also ineffective. Average daily scale pit influent concentrations are compared below with effluent and intake concentrations.

Parameter	2/27	2/28	2/29	3-day Average
21-inch Scale Pit influent	4	5	1	3
36-inch Scale Pit influent	5	3	4	4
46-inch Scale Pit influent	5	3	2	3
Influent average	5	4	2	4
21-inch Scale Pit effluent	7	5	3	5
36-inch Scale Pit effluent	4	4	2	3
46-inch Scale Pit effluent	4	3	<1	2
Effluent average	5	4	2	4
Intake water average	3	5	<1	3

This comparison indicates that during the survey, O/G in the scale pit effluent averaged 1 mg/l greater than intake water concentrations. Furthermore, average daily influent and effluent concentrations were the same.

OUTFALL 015

Effluent from the three primary mill scale pits is discharged to the Monongahela River through outfall 015. As previously mentioned, primary mill production during February 26-29, 1976 was 90% of its rated capacity.

NEIC monitoring results [Tables 4, 5, 6] indicate that none of the pollutants monitored were discharged in significant quantities above intake values except oil/grease. A grab sample for oil/grease collected February 29 contained 25 mg/l, resulting in a mass discharge rate of 600 kg (1,800 lb)/day. All other oil/grease samples contained insignificant quantities. On two of the three days sampled, the pH exceeded 10. USSC self-monitoring data [Table 7] also indicate elevated pH conditions at outfall 015. A comparison of NEIC monitoring results with USSC self-monitoring data [Table 22] indicate that while average flow was the same, USSC reports greater concentrations of total suspended solids than were observed during the survey. It is further noted that USSC pH levels ranged up to 11.6 compared to a maximum pH of 10.2 during the survey. As noted in the previous section, high pH readings were found in the 21-inch and 46-inch mill scale pit effluents. The cause of the elevated pH was not provided by USSC personnel.

USSC has proposed that existing NPDES permit limitations be changed "*to more accurately describe the quality of the current discharge,*" and to eliminate the requirement for additional controls after June 30, 1977. The proposed average daily limitations for total suspended solids and oil/grease are approximately 100 times and 5 times, respectively, greater than the values obtained during the survey.

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	19,100	42,021	57,300	126,063†	160	370	480	1,100
O/G	1,395	3,070	4,186	9,210††	200	600	600	1,800
pH	Shall not be less than 6.0				Range 7.5-10.2			

† *Proposed as a net limitation until June 30, 1977 and a gross limitation thereafter.*

†† *Gross limitation.*

Table 22

COMPARISON OF USSC SELF-MONITORING DATA AND NEIC SURVEY DATA†
OUTFALL 015
USSC DUQUESNE

Parameter	USSC	NEIC††		
	Concentration mg/l	Concentration mg/l	Load kg/day	Load lb/day
TSS	27	2	160	370
O/G	†††	2	200	600
Phenolics	-	0	0	0
Fe_T	-	0.4	30	70
Fe_D	-	0.003	0.27	0.6
Zn	-	0	0	0

Field Measurements	USSC	NEIC
pH Range	8.2-11.6	7.5-10.2
Temperature Range °C	6.1-35	12-18.5
Settleable Solids Range ml/l	-	<0.1-0.4
Average Flow m^3/day x 10^3	84	85
mgd	22.2	22

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† *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake). USSC self-monitoring data is for the period January-October 1975.*

†† *Average of three consecutive days of monitoring from Feb. 26-29, 1976.*

††† *Discharge less than intake concentration.*

OUTFALL 016

The electric furnace shop discharges cooling water and vacuum degassing condensate to a City of Duquesne storm sewer which traverses USSC property. No treatment is provided prior to discharge. The terminus of the storm sewer (outfall 016) is submerged except when the river is at low stage. Upsewer access is limited to a single manhole at which wastewater from the electric furnace shop joins storm sewer water precluding discrete sampling of the City flow. A manhole downsewer from all reported USSC input is used for routine self-monitoring by USSC.

During the NEIC survey from February 26-29, 1976 production averaged 674 m. tons (741 tons)/day, 93% of the reported capacity.[1] The terminus of outfall 016 was submerged and NEIC sampled at the previously described downsewer manhole. Upsewer monitoring of City wastewater was not conducted due to limited access, although the City flow was estimated by NEIC.

Monitoring results [Tables 4, 5, 6] indicate that with the exception of total suspended solids and ammonia negligible quantities of pollutants were discharged. Flow at the outfall 016 sampling point averaged 25,000 m^3/day (6.6 mgd). City flow was estimated based on observations at the upsewer manhole and additional sewer design data including sewer slope and cross-section. NEIC estimated that 4,200 m^3/day (1.1 mgd) was discharged by the City through outfall 016.

The net discharge of total suspended solids and ammonia averaged 280 kg (620 lb)/day and 11 kg (23 lb)/day, respectively. In addition, settleable solids averaged 0.4 ml/l and the pH exceeded 9 on one of the three days monitored. A comparison of USSC self-monitoring data with NEIC data [Table 23] indicates very similar results. USSC also reported that the pH reached a minimum of 4.3 and a maximum of 9.9. A grab sample for organic analysis was collected on February 27, 1976 from the

Table 23

COMPARISON OF USSC SELF-MONITORING DATA AND NEIC SURVEY DATA[†]
OUTFALL 016
USSC DUQUESNE

Parameter	USSC	NEIC[††]		
	Concentration mg/l	Concentration mg/l	Load	
			kg/day	lb/day
TSS	9.0	10	280	620
NH_3-N	-	0.42	11	23
CN_T	-	0.02	0.41	0.9
CN_A	-	0.01	0.2	0.5
O/G	*	1	20	60
Phenolics	-	0.002	0.1	0.1
Fe_T	-	0.6	13	29
Fe_D	-	0.04	0.9	2.0
Zn	-	0.03	0.74	1.6
Fl	-	0.04	0.92	2

Field Measurements	USSC	NEIC
pH Range	4.3-9.9	7.1-9.4
Temperature Range °C	7.8-36	14-22.5
Settleable Solids Range ml/l	-	0.1-0.8
Average Flow $m^3/day \times 10^3$ **	22	25
mgd	5.7	6.6

[†] *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake). USSC self-monitoring data is for the period January-October 1975.*

[††] *NEIC data, excluding field measurements, are average of three consecutive days of monitoring from March 3-6, 1976.*

* *Less than intake concentration*

** *NEIC flow values include an estimated 4,200 m^3/day (1.1 mgd) City flow.*

outfall 016 sampling point. A single organic compound, alpha terpineol, was detected at a concentration of 0.015 mg/l.

USSC has proposed changes in their NPDES permit to "*more accurately describe the current discharge*," and to eliminate the requirement of additional control after June 30, 1977.[5] The proposed net limitations are compared below with NEIC survey results:

Parameter	USSC Proposed Limitations				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	693	1,524	2,079	4,572	280	620	630	1,400
pH	Shall not be less than 6.0				Range 7.1-9.4			

OUTFALL 017

Process wastewaters from the No. 5 bar mill and cooling water from heat treating operations are discharged to the Thompson Run Culvert which, in turn, discharges to the river. Also associated with the No. 5 bar mill and reportedly discharging to outfall 017 is a pickling operation employing sulfuric acid. In addition to USSC wastewaters, Thompson Run Culvert carries City Sewage Treatment Plant effluent and groundwater seepage. Sampling was conducted from a manhole providing access to the sewer carrying plant wastewaters prior to their confluence with Thompson Run Culvert [Fig. 2].

Wastewater treatment is limited to a scale pit approximately 6 m long x 3 m wide x 1.3 m deep (20 x 10 x 4.5 ft) located at the No. 5 bar mill. The scale pit does not include oil removal facilities.

During the survey, the No. 5 bar mill was in operation two turns per day for two of the three days sampled. Production during operation at the bar mill averaged 942 m. tons (1,036 tons)/day while heat treating processed an average of 269 m. tons (296 tons)/day. Production at the bar mill was approximately 127% of its rated capacity. The rated capacity and survey production rate for the heat treating process is unknown by NEIC.

Monitoring results [Tables 4, 5, 6] indicate that only limited quantities of pollutants were discharged. The net total suspended solids and total iron concentrations were 10 mg/l and 1.1 mg/l, respectively. Average daily flow ranged from 29,000 to 35,000 m^3/day (7.6 to 9.3 mgd) and pH ranged from 7.6 to 9.5. Comparison of USSC self-monitoring data with NEIC survey results [Table 24] indicate that USSC reported significantly greater concentrations of total suspended solids, oil/grease and dissolved iron. NEIC flow and pH results were similar to USSC self-monitoring data.

USSC has proposed changes in NPDES effluent limitations for outfall 017. Comparison of the proposed limitations to NEIC survey findings [Table 25] indicate that the daily average discharge of total suspended solids and oil and grease during the survey was only 3% and 9%, respectively, of the proposed limitations. In addition, net dissolved iron concentrations were less than intake values on each of the three days sampled [Table 6].

WATER INTAKE

The Duquesne Plant is served by a single water intake upstream of all outfalls [Fig. 1]. Eight pumps provide a total pumping capacity of 950,000 m^3/day (250 mgd) [Appendix A]. USSC reports that an average of 424,000 m^3/day (112 mgd) of intake water was pumped during January-October 1975. The maximum daily rate for the same period was 534,000 m^3/day (141 mgd).[1]

Three traveling intake screens are backflushed by a spray header system to remove debris which is then returned to the receiving water.

Table 24

COMPARISON OF USSC SELF-MONITORING DATA AND NEIC SURVEY DATA[†]
OUTFALL 017
USSC DUQUESNE

Parameter	USSC Concentration mg/l	NEIC[††] Concentration mg/l	NEIC[††] Load kg/day	NEIC[††] Load lb/day
TSS	30.3	10	290	660
CN_T	0.026	-	-	-
O/G	2.7	1	20	60
Phenol	-	0	0	0
Fe_T	-	1.1	32	70
Fe_D	1.6	†††	-	-
Zn	-	0.01	0.39	0.87

Field Measurements	USSC	NEIC
pH Range	6.6-9.3	7.3-9.5
Temperature Range °C	7.2-38	12-21
Settleable Solids Range ml/l	-	<0.1-0.2
Average Flow $m^3/day \times 10^3$	31	31
mgd	8.3	8.2

[†] *USSC and NEIC data, excluding field measurements, are net values (i.e. discharge-intake).*

[††] *NEIC data, excluding field measurements, are average of three consecutive days of monitoring from March 3-6, 1976.*

[†††] *Discharge concentrations were less than intake concentrations.*

Table 25

COMPARISON OF USSC PROPOSED LIMITATIONS AND NEIC SURVEY RESULTS
OUTFALL 017
USSC DUQUESNE

Parameter	USSC Proposed Limitations[†]				NEIC Survey Data			
	Daily Average		Daily Maximum		Daily Average		Daily Maximum	
	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day	kg/day	lb/day
TSS	3,864	8,500	11,592	25,500	290	660	620	1,400
O/G	300	660	900	1,980	20	60	40	100
Fe_D	-		7.0 mg/l		[††]			

[†] *The USSC proposal calls for the proposed limitations to be gross values until June 30, 1977 after which TSS and O/G values would be net.*

[††] *Daily results showed discharge concentrations less than intake values.*

Backflush water amounts to about 4,900 m^3/day (1.3 mgd). The return of solids to the receiving water once they have been removed is contrary to EPA policy[6] and constitutes an unofficial discharge.

USSC plant officials agreed to provide copies of intake water flow measurement charts at the end of the survey. Subsequently, however, the charts were not provided, for reasons unknown to NEIC. Sampling of intake water was conducted on a time-composite basis. Monitoring results [Tables 4, 5, 6] indicate the average characteristics shown in Table 26. During NEIC monitoring, average net daily flow from outfalls 011-017 [Table 4] totaled 552,000 m^3/day (145.8 mgd), 3% greater than the maximum daily rate reported in 1975.

V. MONITORING REQUIREMENTS

Monitoring requirements as discussed in this section include both sampling and flow measurement. Currently USSC collects grab samples for self-monitoring purposes at all monitoring locations except the intake and outfall 112 where 24-hour equal-volume composite samples are automatically collected. USSC measures and records intake flows continuously with venturi flow meters and circular charts. All other flows are measured instantaneously using lithium tracing techniques.

During the NEIC survey, the dye dilution technique [Appendix C] was used to measure wastewater flows at all outfalls monitored. The outfall structures were not suitable for the temporary installation of standard flow measurement devices by NEIC. Flow measurements were made by NEIC every three hours during each sampling day. Instantaneous measurements indicated flow from individual outfalls varied markedly during the sampling period [Table 26].

Continuous flow measurement is recommended for outfalls 111, 211, 112, 114 and 014 [Table 27]. Standard flow measurement and recording equipment can be installed at these outfalls without major excavation inasmuch as outfalls are all within approximately 3 m (10 ft) of existing grade. Moreover, single instantaneous flow measurements as currently made by USSC are of little value in determining daily wastewater flows and pollutant loads discharged.

Intermittent flow measurement is recommended for outfalls 011, 013, 015, 016 and 017 [Table 27]. Standard flow measurement devices may be installed; however, access to outfalls 011 and 016 is limited but the flow can be measured using tracing techniques. Dye tracing equipment is available for continuous flow measurement and recording. Equipment

Table 26

INSTANTANEOUS FLOW MEASUREMENTS
USSC DUQUESNE
February 26 - March 6, 1976

Station	Date	Time	Flow		Date	Time	Flow	
			m^3/day	mgd			m^3/day	mgd
Outfall 111	3-3	0725	17	4.5	3-4	2115	21	5.6
	3-3	0910	34	9.0	3-5	0040	22	5.8
	3-3	1205	15	4.0	3-5	0330	30	8.0
	3-3	1500	35	9.3	Average		25	6.5
	3-3	1835	26	6.8				
	3-3	2135	27	7.2	3-5	0610	33	8.7
	3-	0040	3.0	0.8	3-5	0915	23	6.0
	3-4	0350	32	8.4	3-5	1215	21	5.6
	Average		24	6.3	3-5	1505	12	3.3
					3-5	1810	36	9.4
	3-4	0600	21	5.6	3-5	2055	28	7.4
	3-4	0910	20	5.3	3-6	0015	19	5.1
	3-4	1210	18	4.7	3-6	0335	21	5.6
	3-4	1505	31	8.1	Average		24	6.4
	3-4	1815	34	9.0				
Outfall 211	3-3	0700	17	4.5	3-4	2140	15	4.0
	3-3	0950	11	2.8	3-5	0030	19	4.9
	3-3	1255	10	2.7	3-5	0300	†	†
	3-3	1610	11	2.8	Average		18	4.9
	3-3	1900	3.0	0.80				
	3-3	2200	5.7	1.5	3-5	0600	†	†
	3-4	0115	6.8	1.8	3-5	0935	25	6.7
	3-4	0417	2.3	0.62	3-5	1305	21	5.6
	Average		8.4	2.2	3-5	1530	34	9.1
					3-5	1905	8.3	2.2
	3-4	0630	14	3.8	3-5	2115	18	4.8
	3-4	0935	20	5.3	3-6	0045	25	6.6
	3-4	1230	22	5.9	3-6	0345	22	5.7
	3-4	1600	16	4.1	Average		22	5.8
	3-4	1845	23	6.0				
Outfall 011	3-3	0640	260	68	3-5	2125	200	54
	3-3	1050	91	24	3-5	0020	190	50
	3-3	1320	160	44	3-5	0355	190	50
	3-3	1635	170	44	Average		190	50
	3-3	1830	220	58				
	3-3	2210	180	48	3-5	0710	230	61
	3-4	0040	180	48	3-5	1015	250	66
	3-4	0350	180	48	3-5	1315	220	57
	Average		180	48	3-5	1615	270	71
					3-5	1840	200	54
	3-4	0750	190	51	3-5	2130	200	54
	3-4	1005	170	45	3-6	0015	160	41
	3-4	1335	180	47	3-6	0330	180	46
	3-4	1620	200	53	Average		210	56
	3-4	1820	190	51				

Table 26 (Continued)

INSTANTANEOUS FLOW MEASUREMENTS

Station	Date	Time	Flow		Date	Time	Flow	
			m^3/day	mgd			m^3/day	mgd
Outfall 012	3-3	0630	150	41	3-4	2130	170	45
	3-3	1040	120	30	3-5	0040	140	38
	3-3	1310	110	28	3-5	0410	140	38
	3-3	1625	95	25	Average		160	42
	3-3	1810	170	46				
	3-3	2200	180	46	3-5	0820	190	50
	3-4	0050	160	44	3-5	1025	200	52
	3-4	0405	150	39	3-5	1245	180	46
	Average		140	37	3-5	1635	200	54
					3-5	1905	160	44
	3-4	0740	160	43	3-5	2140	160	44
	3-4	1005	160	42	3-6	0040	110	30
	3-4	1300	170	44	3-6	0345	100	27
	3-4	1615	140	37	Average		160	43
	3-4	1840	180	48				
City Discharge to 013	3-3	0750	4.2	1.1	3-4	2015	2.1	0.56
	3-3	0915	3.7	0.97	3-5	0140	3.4	0.89
	3-3	1210	3.6	0.96	3-5	0450	2.2	0.58
	3-3	1515	3.0	0.78	Average		4.0	1.1
	3-3	2035	3.3	0.86				
	3-3	2310	23	6.2	3-5	0620	2.5	0.66
	3-4	0210	4.9	1.3	3-5	0920	3.7	0.98
	3-4	0455	4.2	1.1	3-5	1205	3.3	0.86
	Average		6.2	1.6	3-5	1505	3.0	0.79
					3-5	1955	2.9	0.76
	3-4	0730	8.3	2.2	3-5	2225	5.3	1.4
	3-4	0915	5.3	1.4	3-6	0135	2.4	0.64
	3-4	1205	3.8	1.0	3-6	0425	1.5	0.39
	3-4	1515	3.7	0.99	Average		3.0	0.80
	3-4	1950	3.8	1.0				
Outfall 013	3-3	0655	16	4.3	3-4	2120	40	11
	3-3	1105	29	7.7	3-5	0025	49	13
	3-3	1330	27	7.2	3-5	0350	51	13
	3-3	1645	39	10	Average		39	10
	3-3	1835	37	9.8				
	3-3	2210	53	14	3-5	0715	42	11
	3-4	0030	42	11	3-5	1015	38	10
	3-4	0350	33	8.8	3-5	1310	47	12
	Average		35	9.1	3-5	1615	35	9.2
					3-5	1845	34	9.0
	3-4	0600	†	†	3-5	2120	40	11
	3-4	1010	24	6.4	3-6	0015	39	10
	3-4	1340	36	9.5	3-6	0330	42	11
	3-4	1630	32	8.4	Average		40	10
	3-4	1830	39	10				

Table 26 (Continued)

INSTANTANEOUS FLOW MEASUREMENTS

Station	Date	Time	Flow		Date	Time	Flow	
			m^3/day	mgd			m^3/day	mgd
Outfall 114	3-3	0720	7.6	2.0	3-4	2150	11	2.9
	3-3	0940	7.2	1.9	3-5	0115	8.7	2.3
	3-3	1250	6.1	1.6	3-5	0415	16	4.3
	3-3	1545	9.5	2.5	Average		9.9	2.6
	3-3	2020	7.9	2.1				
	3-3	2250	8.7	2.3	3-5	0645	11	3.0
	3-4	0130	9.8	2.6	3-5	0940	9.8	2.6
	3-4	0435	7.6	2.0	3-5	1230	6.0	1.6
	Average		8.0	2.1	3-5	1530	7.9	2.1
					3-5	1930	8.3	2.2
	3-4	0650	9.5	2.5	3-5	2210	8.3	2.2
	3-4	0935	11	2.9	3-6	0110	7.2	1.9
	3-4	1230	7.2	1.9	3-6	0405	6.1	1.6
	3-4	1545	7.9	2.1	Average		8.1	2.2
	3-4	1915	8.3	2.2				
Outfall 014	3-3	0730	36	9.6	3-4	2140	33	8.7
	3-3	0945	39	10	3-5	0100	34	9.0
	3-3	1300	32	8.4	3-5	0420	34	9.0
	3-3	1610	28	7.4	Average		35	9.3
	3-3	2000	36	9.6				
	3-3	2240	44	12	3-5	0700	42	11
	3-4	0120	34	9.1	3-5	0950	45	12
	3-4	0420	29	7.6	3-5	1250	56	15
	Average		35	9.2	3-5	1550	43	11
					3-5	1915	29	7.7
	3-4	0710	35	9.2	3-5	2200	33	8.6
	3-4	0950	36	9.6	3-6	0055	30	8.0
	3-4	1245	36	9.6	3-6	0355	36	9.5
	3-4	1600	36	9.5	Average		39	10.4
	3-4	1855	36	9.6				
21" Scale Pit Effluent	2-26	-	22	$5.8^{\dagger\dagger}$	2-27	2150	22	5.9
	2-26	-	22	$5.8^{\dagger\dagger}$	2-28	0055	22	5.9
	2-26	1350	20	5.4	2-28	0305	25	6.7
	2-26	1630	20	5.4	Average		26	7.0
	2-26	1935	23	6.1				
	2-26	2230	24	6.3	2-28	0650	25	6.5
	2-27	0140	23	6.0	2-28	1015	22	5.9
	2-27	0405	22	5.8	2-28	1250	20	5.4
	Average		22	5.8	2-28	1555	26	6.9
					2-28	1820	23	6.0
	2-27	0725	26	7.0	2-28	2110	23	6.0
	2-27	1005	22	5.7	2-29	0010	23	6.1
	2-27	1345	47	12	2-29	0305	22	5.9
	2-27	1620	22	5.8	Average		23	6.1
	2-27	1905	23	6.1				

Table 26 (Continued)

INSTANTANEOUS FLOW MEASUREMENTS

Station	Date	Time	Flow		Date	Time	Flow	
			m^3/day	mgd			m^3/day	mgd
36" Scale Pit Effluent	2-26	-	18	4.7[††]	2-27	2155	19	5.0
	2-26	-	18	4.7[††]	2-28	0105	19	5.0
	2-26	1405	17	4.5	2-28	0315	22	5.7
	2-26	1648	18	4.7	Average		20	5.3
	2-26	2010	18	4.8				
	2-26	2250	19	5.1	2-28	0705	21	5.5
	2-27	0145	17	4.6	2-28	1030	19	5.1
	2-27	0415	17	4.5	2-28	1310	18	4.8
	Average		18	4.7	2-28	1610	22	5.7
					2-28	1825	18	4.8
	2-27	0740	22	5.7	2-28	2115	20	5.2
	2-27	1020	19	5.1	2-29	0020	19	5.0
	2-27	1355	21	5.5	2-29	0310	20	5.2
	2-27	1630	21	5.5	Average		20	5.2
	2-27	1915	19	5.1				
46" Scale Pit Effluent	2-26	-	47	12[††]	2-27	2240	46	12
	2-26	-	47	12[††]	2-28	0120	56	15
	2-26	1415	59	16	2-28	0325	51	14
	2-26	1715	43	11	Average		59	16
	2-26	2030	36	9.6				
	2-26	2310	56	15	2-28	0715	65	17
	2-27	0200	44	12	2-28	1045	79	21
	2-27	0405	43	12	2-28	1325	75	20
	Average		47	12	2-28	1620	58	15
					2-28	1840	36	9.6
	2-27	0810	55	14	2-28	2130	5.7	1.5
	2-27	1035	60	16	2-29	0035	37	9.7
	2-27	1415	97	26	2-29	0325	49	13
	2-27	1640	65	17	Average		51	13
	2-27	1930	42	11				
Outfall 015	2-26	-	82	22[††]	2-27	2125	83	22
	2-26	-	82	22[††]	2-28	0020	83	22
	2-26	1300	92	24	2-28	0355	95	25
	2-26	1535	87	23	Average		93	24
	2-26	1845	70	18				
	2-26	2145	77	20	2-28	0620	92	24
	2-27	0040	85	22	2-28	0950	90	24
	2-27	0330	82	22	2-28	1345	86	23
	Average		82	22	2-28	1520	99	26
					2-28	1925	84	22
	2-27	0630	97	26	2-28	2200	47	12
	2-27	0940	91	24	2-29	0115	90	24
	2-27	1255	110	30	2-29	0405	81	21
	2-27	1535	92	24	Average		83	22
	2-27	1830	89	23				

Table 26 (Continued)

INSTANTANEOUS FLOW MEASUREMENTS

Station	Date	Time	Flow		Date	Time	Flow	
			m^3/day	mgd			m^3/day	mgd
Outfall 016	2-26	0805	24	6.4	2-28	2140	20	5.3
	2-26	0925	13	3.5	2-28	0035	24	6.3
	2-26	1315	12	3.1	2-28	0335	47	12
	2-26	1550	14	3.8	Average		24	6.3
	2-26	1905	45	12				
	2-26	2215	12	3.3	2-28	0630	28	7.5
	2-27	0055	22	5.9	2-28	0950	21	5.5
	2-27	0350	25	6.5	2-28	1225	16	4.1
	Average		21	5.5	2-28	1540	27	7.1
					2-28	1850	39	10
	2-27	0650	16	4.3	2-28	2140	28	7.3
	2-27	0945	16	4.1	2-29	0045	43	11
	2-27	1320	16	4.2	2-29	0335	37	9.9
	2-27	1545	33	8.8	Average		30	7.9
	2-27	1845	19	5.0				
Outfall 017	2-26	0740	34	9.0	2-27	2115	37	9.9
	2-26	0950	30	7.8	2-28	0005	34	9.1
	2-26	1230	32	8.4	2-28	0345	30	7.9
	2-26	1520	33	8.7	Average		35	9.3
	2-26	1825	23	6.2				
	2-26	2130	28	7.3	2-28	0605	34	9.1
	2-27	0020	29	7.6	2-28	0925	30	8.0
	2-27	0320	29	7.6	2-28	1220	24	6.4
	Average		30	7.8	2-28	1505	28	7.4
					2-28	1905	25	6.7
	2-27	0610	34	9.0	2-28	2150	26	7.0
	2-27	0925	35	9.3	2-29	0100	28	7.4
	2-27	1230	38	10	2-29	0345	31	8.3
	2-27	1525	37	9.9	Average		29	7.6
	2-27	1815	35	9.2				

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† *Flow not determined*
†† *Average of last 6 instantaneous flows*

Table 27

RECOMMENDED MONITORING REQUIREMENTS
USSC DUQUESNE

Outfall Number	Effluent Parameter	Measurement Frequency	Sample Type
111	TSS	1/week	24-hr flow-weighted composite[†]
	NH_3-N	1/week	24-hr flow-weighted composite
	CN_T	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	Zn_T	1/week	24-hr flow-weighted composite
	Phenol	1/week	3 grab samples/24 hr
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	Continuous	Measured
211	TSS	1/week	24-hr flow-weighted composite
	NH_3-N	1/week	24-hr flow-weighted composite
	CN_T	1/week	24-hr flow-weighted composite
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	Continuous	Measured
011	TSS	1/week	24-hr flow-weighted composite
	NH_3-N	1/week	24-hr flow-weighted composite
	CN_T	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	Zn_T	1/week	24-hr flow-weighted composite
	Phenol	1/week	3 grab samples/24 hr
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	1/week	Measured[††]
112	TSS	1/month	24-hr flow-weighted composite
	NH_3-N	1/month	24-hr flow-weighted composite
	CN_T	1/month	24-hr flow-weighted composite
	pH	1/month	Grab
	Temperature	1/month	Grab
	Flow	Continuous	Measured
012	pH	1/month	Grab
	Temperature	1/month	Grab
	Flow	1/month	Estimated
013*	TSS	1/month	24-hr flow-weighted composite
	NH_3-N	1/month	24-hr flow-weighted composite

Table 27 (Continued)

Outfall Number	Effluent Parameter	Measurement Frequency	Sample Type
013 (Cont.)	Fe_T	1/month	24-hr flow-weighted composite
	O/G	1/month	3 grab samples/24 hr
	pH	1/month	Grab
	Temperature	1/month	Grab
	Flow	1/month	Measured[††]
Water Treatment Plant**		Filter Backwash	
	TSS	1/month	Equal-volume composite
	pH	1/month	Grab
	Temperature	1/month	Grab
	Flow	1/month	Estimated
		Settled Solids	
	TSS	1/month	Equal-volume composite
	pH	1/month	Grab
	Temperature	1/month	Grab
	Flow	1/month	Estimated
114	TSS	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	Fl	1/week	24-hr flow-weighted composite
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	Continuous	Measured
014	TSS	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	Fl	1/week	24-hr flow-weighted composite
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	Continuous	Measured
015	TSS	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	O/G	1/week	3 grab samples/24 hr
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	1/week	Measured[††]
016	TSS	1/week	24-hr flow-weighted composite
	Zn	1/week	24-hr flow-weighted composite
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	1/week	Measured[††]

Table 27 (Continued)

Outfall Number	Effluent Parameter	Measurement Frequency	Sample Type
017	TSS	1/week	24-hr flow-weighted composite
	Fe_T	1/week	24-hr flow-weighted composite
	Fe_D	1/week	24-hr flow-weighted composite
	O/G	1/week	3 grab samples/24 hr
	pH	1/week	Grab
	Temperature	1/week	Grab
	Flow	1/week	Measured[††]

† *24-hr flow-weighted composite samples shall consist of a minimum of 8 sample portions collected at equally spaced intervals (i.e. every 3 hr).*

†† *Flow measurement to consist of a minimum of 8 readings equally spaced over the 24-hr sampling period.*

* *Upsewer monitoring should also be conducted at the same frequency and for the same parameters to determine City of Duquesne input.*

** *Intermittent discharges to outfall 013. Composite shall be collected during the backwashing of 1 filter/month and the discharge of 1 tank of settled solids/month.*

costs are approximately $2,700-$3,000.* In addition, a suitable tracer such as Rhodamine WT dye would cost about $2.00/day per 3,800 m^3/day (1 mgd) of flow.

Recommended monitoring requirements with respect to effluent parameters, measurement frequency and sample type are tabulated by outfall [Table 27]. Significant parameters for process wastewaters are from the EPA *Development Document for Steel Making.*[7] Where specific additional rationale exists for the recommended monitoring requirements, it is addressed by outfall. Where no additional rationale exists, the outfall is not discussed.

OUTFALL 111

The present sampling location is a manhole on the blast furnace thickener effluent line located approximately 18 m (60 ft) from the thickener effluent. This manhole also receives overflow from the thickener influent pumping station in the event lift pumps malfunction. The samples would not be representative if the lift station were overflowing during sample collection. Therefore, USSC should install an alarm on the lift station to immediately signal plant personnel when overflowing occurs. Monitoring for total iron and zinc is required inasmuch as significant quantities of each metal were discharged during the survey.

OUTFALL 011

Outfall 011, presently sampled at the river discharge, is frequently submerged making sampling impossible. USSC should provide access to the

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* *Costs do not include maintenance, extra parts, manpower, protective structures or power.*

011 sewer such that sampling can be conducted during high water. USSC drawing No. 23529 indicates a manhole located within 15 m (50 ft) of the terminus of outfall 011 which should be an acceptable monitoring point during high water. Monitoring for all process wastewater parameters is required because NEIC findings indicated the presence of quantities of cyanide, total iron and zinc in excess of quantities present in outfalls 111 and 211.

OUTFALL 012

Currently outfall 012 is sampled at its terminus. High water frequently submerges the sampling point. In addition blast furnace wastewaters [outfall 011] are mixed with outfall 012 due to the previously described interconnection [Fig. 1]. Monitoring requirements [Table 27] are conditional based on the sampling point being moved upsewer of the 011 interconnection.

OUTFALL 013

USSC presently monitors outfall 013 only at its terminus. During the survey an acceptable sampling point was located and used to monitor the City of Duquesne contribution. Intermittent discharges from the USSC water treatment plant were also monitored. In order for USSC to determine their average net discharge through outfall 013, monitoring at all three of these locations is necessary.

Upsewer flow from the City of Duquesne may be estimated. Monitoring for oil and grease and ammonia [Table 27] is necessary inasmuch as these parameters were present in significant quantities in the City wastewater. USSC water treatment plant discharges from filter backwashing and solids blowdown account for approximately one-third of the daily average TSS load to outfall 013 and must be monitored.

OUTFALL 114

The monitoring location currently used is subject to surface runoff in the event of significant precipitation. When USSC installs permanent flow measurement facilities, the design should provide for an adequate sampling location. Total iron was discharged in significant quantities during the NEIC survey and is therefore included in the monitoring requirements [Table 27].

OUTFALL 014

Monitoring for process wastewater parameters is required because it is apparent from survey results [Table 19] that BOP shop cooling water is contaminated with significant quantities of suspended solids and total iron. Continuous flow measurement is feasible through the installation of a standard flow measurement device at the terminus of outfall 014.

OUTFALL 016

City of Duquesne wastewater is discharged to outfall 016 but currently not monitored by USSC. During the NEIC survey, a suitable site for monitoring City input was not located and City wastewater was not monitored. USSC should investigate further and determine if a location exists at which City flows can be sampled. An acceptable alternative to the above is for USSC to monitor their discharges before they reach the 016 sewer.

REFERENCES

1. Letter - Jan. 26, 1976 with attachments from Mr. James L. Hamilton III, Manager, Environmental Control - Water, United States Steel Corp., to Mr. S. R. Wassersug, Director, Enforcement Division, U. S. Environmental Protection Agency, Region III, Philadelphia, Pa.

2. Letter - Aug. 1, 1975 with attachments from Mr. James L. Hamilton III, Manager, Environmental Control - Water, United States Steel Corp. to Mr. S. R. Wassersug, Director, Enforcement Division, U. S. Environmental Protection Agency, Region III, Philadelphia, Pa.

3. Information provided by United States Steel Corp. to EPA Region III, Philadelphia, Pa., for development of NPDES permit.

4. Letter - April 23, 1976, from Mr. James L. Hamilton III, Manager, Environmental Control - Water, United States Steel Corp. to Mr. F. L. Voigt, Enforcement Division, U. S. Environmental Protection Agency, Region III, Philadelphia, Pa.

5. Original Request for Adjudicatory Hearing as Amended, United States Steel Corp., Dec. 13, 1974.

6. Interim Effluent Guidance for NPDES Permits, June 1972, Office of Permit Programs, USEPA, Washington, D.C.

7. Development Document for the Steel Making Segment of the Iron and Steel Manufacturing Point Source Category, Feb. 1974, USEPA Effluent Guidelines Division, Washington, D.C.

APPENDICES

A	Duquesne Works Reconnaissance
B	Chain of Custody Procedures
C	Dye Dilution Technique for Flow Measurement
D	Analytical Procedures, Quality Control

REPORT ON EPA RECONNAISANCE/INSPECTION OF SEPTEMBER 23-27, 1975 AND PRELIMINARY EVALUATION FOR PROSPECTIVE NEIC FIELD SAMPLING SURVEY, U.S. STEEL CORPORATION, DUQUESNE STEEL PLANT, DUQUESNE, PA.

The Duquesne Steel Plant is combined with the National Steel Plant on the other side of the Monongahela River to give a single management unit known as the National-Duquesne Works of U. S. Steel. The Duquesne Plant is situated about 12.5 miles above the Ohio River at Pittsburgh. Duquesne is fairly well integrated with blast furnaces producing basic iron; the manufacturing of steel by the Basic Oxygen Process and also a series of electric furnaces; primary hot rolling of steel into slabs, blooms, billets and rounds via 46-inch, 36-inch, and 21-inch mills; manufacturing of bars and rounds in a No. 5 bar mill; and special heat treating and steel conditioning facilities. Duquesne produces much of the steel for the National Plant. Capacity production at Duquesne has been cited as: 7550 TPD basic iron, 8100 TPD of BOP steel, 800 TPD of electric furnace steels, and 6100 TPD of hot formed and rolled primary and finished steels, mostly billets, bars and rounds.

Water intake or the sum of wastewater and cooling water discharges for the Duquesne Plant are in the range of 90 to 120 MGD with September 1975 figures approximating 105-110 MGD. Duquesne would seem to have a lesser degree of waste treatment as compared to the National Plant. Waste outfalls at Duquesne are situated in such manner as to be seriously impacted by high River stages.

Duquesne has seven permitted outfalls, i.e. 011 to 017; four intermediate sampling locations i.e. 111, 211, 112 and 114; a water intake sampling point; plus a number of storm sewers through USSC property. Waste loads are somewhat evenly distributed through various outfalls at Duquesne with the more important outfalls comprising 011, 012, 014, 016 and 017. A contemplated field sampling survey for Duquesne is tentatively visualized involving 14 or less primary stations. Assuming reasonably dry weather, only one of the locations might be significantly impacted by the River whereby the Sampling probably would need to be moved upstream on the particular sewer network.

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Attendees: Persons making inspection of the Duquesne Plant during September 23-26, 1975, are listed previously in the USSC, National Plant reconnaisance report written by NEIC

BACKGROUND

A significant part of the background and production information for this plant was covered in a previous NEIC report on the National Steel (part of the overall National-Duquesne Works)Plant. The Duquesne mill more or less came into existence around 1886 when a small Bessemer converter shop together with a blooming mill was constructed at the Duquesne site to produce rails for the Nation's early railroads. These Works were sold to the Allegheny-Bessemer Co. in 1888, which in turn were sold to Andrew Carnegie in 1890. Between 1890 and 1910, Duquesne was equipped with six blast furnaces; two open hearth shops, bloom and billet mills and five bar mills giving a large capacity in semi-finished steel shapes. In 1901, the Andrew Carnegie holdings became part of the U.S. Steel Corporation.

From 1910 to 1930, new bar mills and an electric furnace were added. In 1941 due to the war effort, a complete electric furnace complex and one of the more advanced heat treating and finishing shops in the U.S. were constructed. Additional electric furnace capacity was added in the 1950's, primary mills came on line in 1959, the large "Dorothy" blast furnace (No. 6) was finished in 1963, and the two-furnace BOP facility was made available in 1963. In 1969, the Duquesne Plant was consolidated with USSC's National tubular operations under a single management.

PRODUCTION

The Duquesne Plant is important in three main areas: 1) producing blast furnace pig iron; 2) manufacturing steel by the BOP and electric furnace processes; and 3) operating hot-formed steel rolls yielding blooms, billets and other semi-finished structural shapes and a bar mill producing steel in final product form. It was previously indicated in the National report that roughly 2/3 of the Duquesne steel remains at Duquesne for subsequent working whereas 1/3 is shipped over to National. Capacity or maximum production at Duquesne has been previously given as approximating:

7,550 TPD iron
8,900 TPD steel from BOP and electric furnaces.
6,100 TPD hot-formed semi-finished and finished steel products

Duquesne is said to be operating with some 3,000 employees and presently running 50-65% of capacity (probably closer to 50%). General process operations have already been described in the National Plant report but will be further amplified below. Total water intake and waste discharges at Duquesne are in the order of 110 to 120 MGD to and from the Monongahela River. The plant is on the Monogahela River and roughly situated 12-13 miles upstream of the juncture of the Mon and Allegheny Rivers in downtown Pittsburgh. Various waste outfalls and their contributing sources are tabulated in the following.

PRELIMINARY OUTFALL DESCRIPTION

The draft NPDES permit and Fact Sheet of December 1974 describe Duquesne outfalls as running from 011 through 017 plus the intermediate stations of 111, 211, 112 and 114, for a total of 11 outfalls and/or monitoring points.

The 011 Outfall situated to the rear or east of the Linde Oxygen Plant constitutes a combined flow generally from the Blast Furnace area. We note that only Blast Furnace Nos. 4 and 6 were operational during our inspection. Tom Johns does not expect Blast Furnaces Nos. 1 and 3 to come on line anytime in the forseeable future. The draft permit describes 31.4 MGD coming down to the 011 sector but 5.9 MGD is diverted over to the 012 outfall sector leaving 25.5 MGD out of Outfall 011. The 31.4 MGD was reported as originating from:

18.0 MGD cooling waters from No. 6 Blast Furnace (Dorothy)
6.6 MGD(untreated?)slag pit waters from No. 4 Blast Furnace.
4.5 MGD process water(presumably from gas cleaning operations), i.e. 1.5 MGD from each of Blast Furnace Nos. 1, 3 and 4. This 4.5 MGD is treated in a thickener - settler before release
2.3 MGD process water (from gas cleaning) associated with No. 6 Blast Furnace passing through same thickener - settler as mentioned directly above.

The 18.0 MGD Blast Furnace No. 6 cooling water flow magnitude appears high especially considering figures received from Weiskircher during the week of September 22 of 2.1 MGD venturi scrub flows and 5.0 MGD cooling water flows. If the 18 MGD were reduced to 5 MGD, total 011 flow would amount to 12.5 MGD instead of 25.5 MGD.

There are no Interim Permit limitations for 011. Final limits include Gross concentration maximums for cyanide A and Oil/Grease.

The 111 Sampling Location was described as the effluent coming off the above thickener-settler and made up of 6.8 MGD gas cleaning process waters as a total from the four existing blast furnaces. This value does not take in account some flow reduction necessarily due to sludge underflows being drawn off the bottom of the clarifier. Permit Limitations for 111 include Net loads given for TSS, ammonia, phenolics, and total and Cyanide A.

The 211 Sampling Location was defined as overflow effluent from the slag pit serving the No. 4 Blast Furnace and having a flow capacity rating of 6.6 MGD. Permit Limitations are for Net TSS loads, only.

The 012 Outfall is situated to the rear and directly east of the Linde Oxygen Plant. Outfalls 012 and 011 at the River are actually side by side and within a few feet of each other. This outfall was rated in the draft NPDES permit as 57.6 MGD comprising:

45.0 MGD cooling waters from the Linde Oxygen production plant
5.9 MGD blast furnace(excess) process and cooling water flows diverted from the 011 sewer line.
6.5 MGD overflow effluent(untreated?)from the slag pit serving No. 1 Blast Furnace.

NPDES permit limitations for 012 include maximum allowable Gross temperature and Cyanide A, but only after June 1977.

The 112 Sampling Location was defined as the overflow effluent from the slag pit serving the No. 1 Blast Furnace and having a flow rating of 6.5 MGD.

For the above two sewer systems of 011 and 012, the 011 sewer network was essentially written on allowable NET loads except for Gross concentrations at the 011 station. The 012 sewer network was written for Gross concentrations but only on TSS.

The 013 Outfall comprises a city sewer believed to come down Duquesne Avenue from the SW which combines with a series of Blast Furnace cooling waters including 4.0 MGD from No. 1 Furnace; 4.0 MGD from No. 3 Furnace (Nos. 1 & 3 units not currently operational); and 4.5 MGD from the No. 4 Blast Furnace. The draft NPDES permit gives an indicated flow of 12.5 MGD for Outfall 013 and only temperature and Oil/Grease Gross concentration limits through the duration of the permit.

The 014 Outfall receives two spent streams but all flows essentially derive from the Duquesne Plant BOP shop. The first of these is 6.9 MGD cooling waters from the Basic Oxygen Furnace sector. To this is added approximately 1.1 MGD overflow from a thickener serving wet gas cleaning on the BOP unit. During our visit it was furthermore indicated by the Company that the Grant Street storm sewer also passes through the juncture box receiving the other two flows. The draft NPDES permit gives a total flow of 7.9 MGD for this sewer network.

The 114 Sampling Location represents the BOP thickener effluent upon leaving the settler-clarifier and before entering the main 014 sewer network. The draft permit for 014 provides only temperature limits and then only after June, 1977. Limitations for 114 include immediate Net TSS load allowables and Gross dissolved iron concentrations. The same type of parameters and limits are cited after June 1977.

The 015 Outfall is reported to serve the three Duquesne primary hot rolling mills. These include the 46 inch mill more or less followed by the 36 inch mill, then followed by the 21 inch mill. Respective spent process flows treated by scale pits and discharging from the three mills are stated as 11.0 MGD from the 46 inch mill, 2.5 MGD from the 36 inch mill (scale pit), and 2.3 MGD from the 21 inch mill, for a total wastewater flow of 15.8 MGD. Treatment on the 015 sewer network consists of the various available scale pits and some rudimentary oil skimming. Permit limitations on the 015 system include Net TSS and Oil/Grease loads and Gross Oil/Grease and temperature concentration maximums.

The 016 Outfall serves the Electric Furnace steel production sector including cooling waters of up to 3.2 MGD, and untreated process flows of up to 2.1 MGD from the vacuum degasing operations found in the electric furnace building. A city storm sewer is also shown to be connected to the 016 sewer line thought by USSC to be either the Hamilton Street or the Whitfield Street system. The permit flow for 016 amounts to 5.3 MGD. The 016 Outfall intercepts the Monongahela River a very short distance downstream of 015. These two sewers are in very close proximity duplicating a similar situation at 011 - 012. Net and Gross permit parameters for 016 are of the same type as for the 015 Outfall.

The 017 Outfall encompasses the bottom or most northerly end of the Duquesne mill property and picks up the Thompson Run (natural) drainage course which is piped under USSC property for its lowermost one-quarter mile before emptying into the Mon River, together with process effluents from the No. 5 bar mill treated via scale basin(s), and various process or contact effluents from heat treating end finishing facilities (the latter mostly if not totally for bars and rounds). Thompson Run above Steel property receives final effluents from the city of Duquesne contact stabilization activated sludge treatment plant. Data on Duquesne municipal wastewater flows and characteristics are tentatively planned to be collected by NEIC in the future. Permit flows via 017 are shown to be 5.8 MGD which comprises 2.8 MGD from heat treating sources and 3.0 MGD from the No. 5 bar mill complex. Limitations in the NPDES draft permit provide for Net TSS and Oil/Grease loads, and Gross Oil/Grease, dissolved iron, total cyanide and temperature concentration maximums. The draft permit specifies USSC sampling of their Waste contributions before these flows enter into the Thompson Run storm collection conduit.

SPECIFIC PROCESS OPERATIONS, PLANT INSPECTION

Air Pollution Controls at Duquesne

On the air pollution control side, Tom Johns, Chief Engineer explained since the early 1970's there has been installation of 1) A Bag House on the electric furnace building; 2) An Electrostatic Precipitator on the 46 inch mill automatic scarfer finished in early 1975; and 3) Various improvements made and still continuing at the BOP Shop. The electric furnace operations were said to previously obliverate the city with black smoke. The present bag house system is reported to give high overall treatment performance. The precipitator on the 46-inch mill scarfer is likewise reported functioning well. Johns stated in the BOP sector, they are now catching about 99 percent of the particulates. Before when they were balancing the fans, efficiency of removal dropped to about 64-66%. Now they shut the BOP shop down when the balancing work is done. During our week at Duquesne, the BOP shop was not operating during the first shift but was coming up about noon (i.e. 2 shift operation). Sometimes a pinkish cast was said to exist by Johns (appeared to be red to us) but USSC, Duquesne,is still said to be within existing county air pollution control limitations. Additional fan capacity is being added to withdraw more roof top emissions originating from the furnaces in the BOP Shop. Johns admits some smoke is escaping the roof monitors. They have also recently completed construction of a roof baffle off one of the BOP furnaces. Personnel are monitoring the No. 1 Furnace with a damper, and results so far are encouraging. There are two BOP furnaces or kettles at Duquesne, each rated at 215 tons steel per turnover (heat) with a turnover occurring about every 50 minutes. After experimental work is completed on Furnace No. 1, the Company plans to move to Furnace No. 2 with improvements. These procedures if implemented fully, are thought capable of reducing roof emissions up to two-thirds. Transfer of materials from the subladle over to the regular charging ladle appears to cause a majority of the emissions in the BOP shop. There was discussion of further installation of a bag house at the BOP building together with installation of a hood over the two metal pits and fan system leading to the bag house.

Other significant sources of air pollution at Duquesne include the 21-inch conditioning yard and the hand scarfing (via torches) sector inside the 21-inch conditioning building. Duquesne also employs three grinders for handling select pieces of steel inside the steel conditioning building which seems to contribute to air pollution. Nevertheless the latter sector is classified as a zero wastewater discharge site. We noted at the southern end of the Duquesne yards a further fugitive dust problem prevailing in the vicinity of the raw materials conveying and handling systems.

Air problems with the FeMn operations at National were mentioned in our subsequent discussions with Johns and Weiskircher. The most serious air problem is perhaps that associated with the pouring of the molten FeMn into the sand cast beds causing heavy airborne emissions at times so heavy as to blanket the city street alongside the plant. These omissions are possible up to seven times daily. Continuing air problems are also reported present attendant with normal operations of the No. 1 FeMn blast furnace at National which is functional seven days a week.

Normal Shift Operations at Duquesne

The Blast Furnaces and BOP shop both operate 7 days a week, the blast furnaces continuously and the Basix Oxygen Furnaces 2 turns daily. The Primary mills are functional about 10 turns/week and the No. 5 bar mill 12 to 15 turns weekly. It is however noted the No. 5 mill is generally down on the weekends. Conversely some of the primary mills operate the weekend but are down on one or more weekdays. The hot and/or cold cutting saws seem to operate most often 8 hours on and 4 hours off. The electric furnaces run about 10 turns a week going on the weekends but down on one or more weekdays. We were told the Duquesne Steel Mill produces very little if any of its own power on site and practically all power comes from the outside i.e., other USSC plants. The Nos. 6 and 7 old bar mills were closed at Duquesne a considerable time in the past, the essential equipment pulled, and only the buildings remain. Of the blast furnaces, No. 2 is no more. Nos. 1 and 3 were last operational 9-12 months past. Nos. 4 and 6 were functioning during our inspection. All four furnaces are straight basic iron furnaces. Tom Johns declared that there was very little chance of either the No. 1 or 3 units being brought on line in the next 9 months and there is current talk of possibly even pulling down No. 4. There was uncertainty among USSC people whether cooling waters were still running through the Nos. 1 and 3 Blast Furnaces at this time. All open hearth steel-making operations have long ceased at Duquesne.

Upstream Plant Activities and Sewer Lines

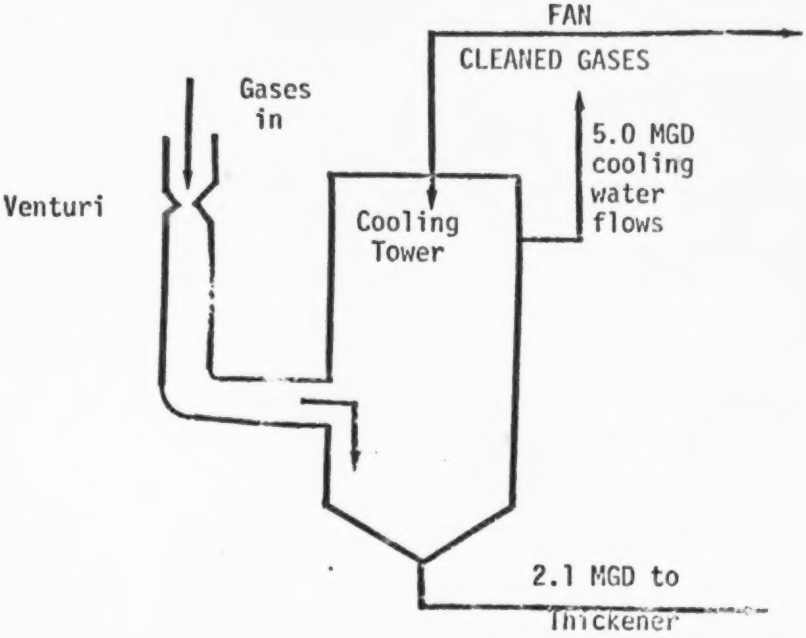
A Center Street city storm sewer is reported to traverse USSC property intersecting the Mon River in the vicinity of the old Pig Casting Machine and Ladle House. We did not find this sewer, our task made more difficult by Steel having no information on this sewer, the River stage being exceptionally high during our inspection visit, and the River bank because of its steepness offering little view of the shoreline. Photographs taken from an EPA river boat run of June 21, 1975 showed an unidentified discharge flowing into the main River close to this same site.

The 011/012 Outfalls and Duquesne Blast Furnace Systems

The NPDES permit Fact Sheet and accompanying rationale cite the 011 Outfall as having a capacity flow of 37.3 MGD whereas our calculations and the plant schematic show only 25.5 MGD. Weiskircher during our inspection gave a probable spent flow for 011 of about 20.0 MGD but said the effluent could vary from 18 to 45 MGD. By virtue of lithium chloride measurements, USSC from their self-monitoring data has reported flow rates for 011 from 11.8 to 53.6 MGD; a second month's data shows respective flows of 17.7 to 21.2 MGD; and a single flow of 24.0 MGD was obtained for June, 1975. USSC normally conducts lithium chloride flow measurements in the 011 sewer system twice a month.

A 90 ft. diameter settler-thickener is the key element on the 011 sewer network. Blast Furnaces Nos. 1, 3 and 4 each contribute 1.5 MGD venturi wet gas scrubbing effluent to this thickener. Weiskircher considers these flows as representing reasonably good numbers. The No. 6 blast furnace contributes another 2.3 MGD wet gas scrub waters to this settler. Effluent from the 90 ft. diameter clarifier is normally about 6.6 - 6.8 MGD but even Weiskircher admitted with Nos. 1 and 3 units down, these Settled flows (at Station 111) should be significantly less. A Betz flocculator is utilized in the No. 6 BF thickener.

The No. 1 Blast Furnace is equipped with a dry dust catcher with the gases then going to the venturi scrubber serving the Nos. 3 and 4 Blast Furnace units. The Nos. 3 and 4 furnaces have a common venturi wet scrubber followed by a cooling tower for cooling these gas streams. The No. 6 furnace has its own dust catcher, venturi scrubber and gas stream cooling tower. Cleaned gases off the cooling tower are generally sent back to the Blast Furnace stoves and/or to the Duquesne boiler house. The bulk of the cooling flows apparently originate from the cooling tower(s) and are sent to the River untreated. A rough schematic of water flows around the No. 6 Blast Furnace gas cleaning circuit as provided us by USSC personnel the week of September 22, is provided below. The venturi scrub waters as mentioned above find their way to the thickener. Fans and stacks more or less comprise the remainder of the assemblage. USSC may be measuring influent flows to the thickener separately from the No. 6 BF unit, and the combined Nos. 3 and 4 BF venturi scrub steam.



No. 6 BLAST FURNACE GAS CLEANING SYSTEM (BOP Gas Cleaning System may be quite similar to No. 6 Circuit Described above).

Design data given the State in 1963-1964 shows the thickener to be 90 ft. in diameter by 9 ft. deep intended to handle an incoming flow of 1200 gpm ∿ 1.74 MGD. At this flow, waste detention time was given as 7.2 hours. The discharge from the thickener was expected to contain 85 to 100 mg/l TSS. We note that actual flows reported entering the No. 6 Blast Furnace thickener are considerably larger than the 1.74 MGD design flow cited above.

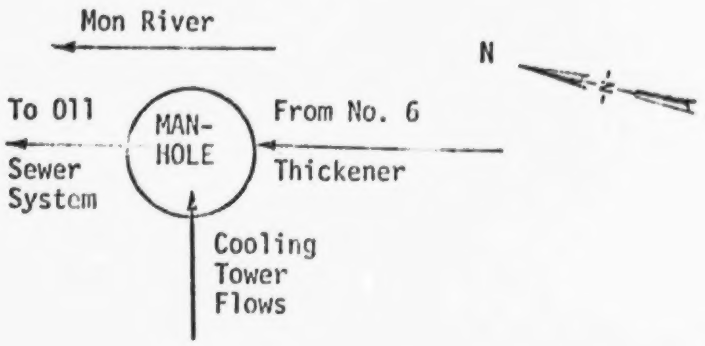
We further note in certain State file materials dated 6/20/74 and 6/27/74 that a schematic of a proposed recycle system for the Nos. 1,3,4 and 6 Blast Furnaces at Duquesne is given. The new system envisions two 90 ft. diameter thickeners each receiving 3050 gpm (4.42 MGD) gas cleaning scrub waters plus vacuum filter filtrate return. The thickener overflows are merged with blast furnace cooling waters (the filter at 7,000 gpm = 10.14 MGD) giving a total of 19.00 MGD going to a proposed cooling tower. A 10 percent bleed off was assumed from this system equating to 1.89 MGD representing a final discharge from both the 011 and 012 Outfalls. The filter cake off the vacuum filters were destined for the sinter plant.

Slag off the No. 1 Furnace is spray-treated and deposited in a slag pit. USSC indicates their preference for air cooling but it is reported that Duquesne Slag cannot wait long enough before hauling out this slag material. Weiskircher estimates drainage from the BF No. 1 slag pit of 100,000 gpd when the No. 1 Furnace is operating. This slag pit discharge is to be monitored under conditions of the NPDES draft permit as Station 112. The materials accompanying the NPDES permit indicate waste flows for 112 as high as 6.7 MGD which appears to be many-fold the actual values.

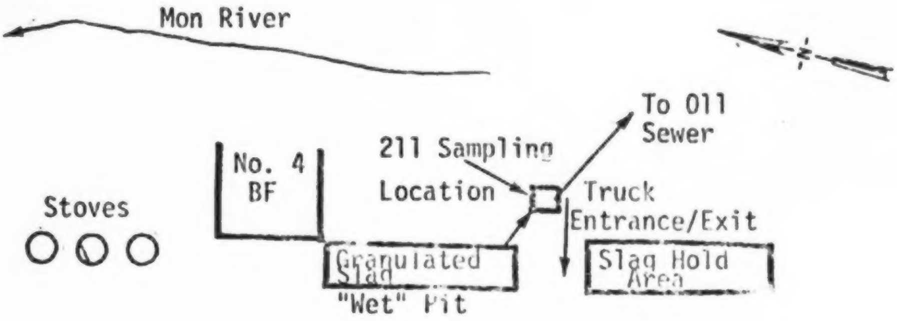
Slag from the No. 3 Blast Furnace is reported to be deposited in "thimbles" and taken to Taylor Dump by the Duquesne Slag Company. No discharge is believed to originate from these slag operations. Slag from the No. 4 Furnace is quenched in water bath compartments yielding granulated slag. The overflow from this system is measured and sampled at Station 211. The granulated slag pit is operated in a manner whereby service water is permitted to run continuously into the slag basin. High-pressure water is utilized during the 6 or so slag coatings daily to move the slag into the center of the basin. The high-pressure sprays may only be on for a total of about one hour per day. If flows were determined during the time of high pressure sprays, flow rate could conceivably be as high as 6.6 MGD, the value given in the draft permit materials. However the average daily flow is probably closer to 2.0 to 2.5 MGD. The Company employs lithium chloride measurements at 211. Granulated slag is essentially removed by clam shell from the quench basin(s) into receiving trucks at the No. 4 Blast Furnace site. Slag from the No. 6 Blast Furnace is cast into hard slag beds. Excess water in this sub-system is recycled to a small reservoir and back to Steel's slag circuit. Slag pits have been recently rebuilt in the No. 6 Blast Furnace sector. Water is drawn down to the south end of the basin or pit where it is dissipated via percolation. The No. 6 slag handling system is considered to have no wastewater discharges. The 90 ft. diameter thickener is said by USSC personnel to be receiving less waste inflows because of the Nos. 1 and 3 Blast Furnaces in down position.

USSC described the thickener effluent or "111" sampling as being conducted in the effluent launder off the thickener. This settler is semi-enclosed and contains a very warm flow. The Company has added lithium chloride to this effluent launder and sequentially measured the chemical at the next downstream manhole, cooling water flows off the No. 6 cooling tower are bypassed around this thickener to the 011 sewer system. Thickener sludges are vacuum filtered, the filter cake being deposited on the ground until such time as it is transported away by truck. Filtrate is returned to the No. 6 thickener-settler. We presume materials off the dry dust catchers are recovered for reuse at the Saxenberg sinter plant whereas vacuum filter cakes are all taken to sanitary landfill or dumping grounds. Filter cake is permitted to directly mix with yard waters which is a highly-unsatisfactory practice.

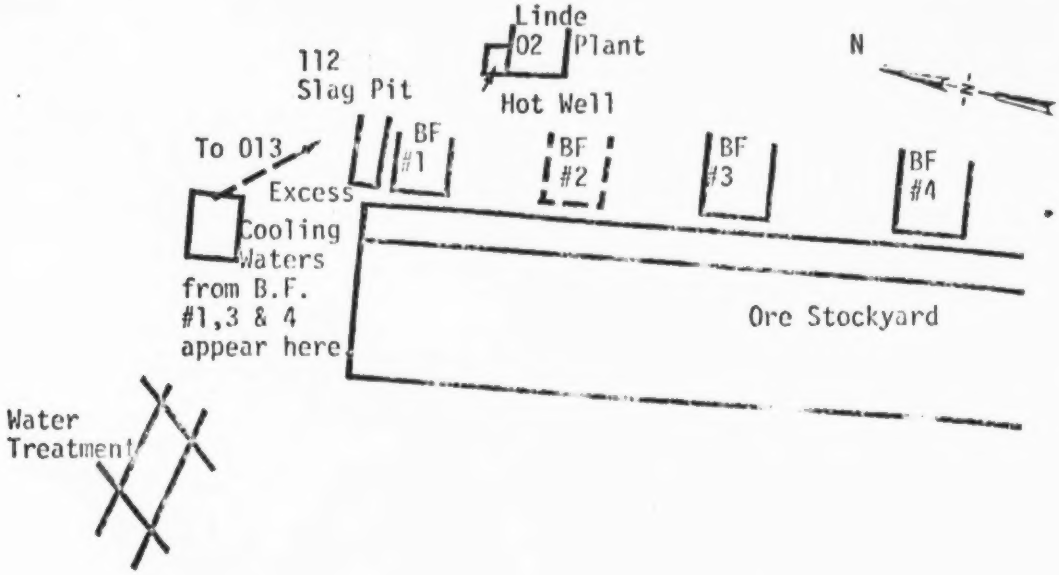
A manhole directly north and approximately 50 ft. away from the No. 6 BF thickener receives both the thickener overflow plus cooling tower spent waters as depicted below. Lithium chloride added at the No. 6 thickener is


Mon River
N
To 011
Sewer
System
MAN-
HOLE
From No. 6
Thickener
Cooling
Tower
Flows

said to require only 5 minutes before reaching the River via 011 (or possibly even the 012 sewer system). The alternate point for lithium chloride addition is at the Blast Furnace No. 4 slag system, i.e. at or ahead of sampling location 211 (has also been added directly to the granulated slag water quench basin). The 211 sampling manhole or box manhole is situated at the SE corner of the No. 4 granulated slag pit as shown below. The rectangular opening in the 211 MH cover approximates 13" x 10". The sewer served by 211 is estimated to be 3 to 4 ft. in diameter. Depth to water level is about 12 feet. If one needs to climb up to granulated slag quench basins, the area must first be cleared for CO gas and it would be best to obtain concise clearance from the Company before proceeding.


Mon River
To 011 Sewer
211 Sampling Location
No. 4 BF
Stoves
Truck Entrance/Exit
Granulated Slag "Wet" Pit
Slag Hold Area

Inspection was made of the No. 1 Blast Furnace area and Sampling Location 112. This station is directly east of the No. 1 Furnace and slag pits and directly north of the Linde Oxygen Plant. While in this area we also inspected a point where excess cooling waters from Blast Furnace Nos. 1, 3 and 4 are brought to ground elevation before being discharged to the 013 sewer system. The appropriate schematic is given:



The Company employs the Pro-Tech sampler for monitoring the 112 location. The 112 manhole is approximately 10 ft. to water and accessible. The concensus of observations made at 112 was that there was little or no flow movement through this point. The Company has yet to make an initial sampling of 112. The 112 No. 1 Furnace slag overflow has been estimated by USSC at 100,000 gpd, but only when the No. 1 Furnace is operating. We probably can install a weir-recorder and sand-bag this location if 112 were to operate during any future NEIC survey.

The hot well of the Linde Oxygen Plant was next visited. The hot well is on the NW side of the Linde Plant. USSC adds lithium chloride at this point for flow measurement on the 012 sewer. The draft NPDES permit materials describe the Linde Plant as having cooling water flows of 45.0 MGD, or 87 percent of the total 57.6 MGD reported for the 012 Outfall. USSC indicates flow time is only 2 minutes from the Linde Plant hot well to the River.

For the 012 Outfall, i.e. the terminus of the sewer, the NPDES permit Fact Sheet and Technical Rationale specify a total flow of 37.7 MGD. Our calculations show 57.6 MGD including a carryover of 5.9 MGD from the 011 to the 012 drainage systems and assuming that the Linde Oxygen Plant contributes in the area of 45.0 MGD cooling waters as reported by the Company. It was explained that the 011 Outfall invert is simply higher than the 012 invert. Two months of Company flow data for the 012 Outfall show flows of 30 to 49 MGD one month, 19.5 to 23.3 MGD for another month, and 20.0 MGD determined from a single value in June 1975. Weiskircher indicated a current flow for 012 in the area of 40.0 MGD.

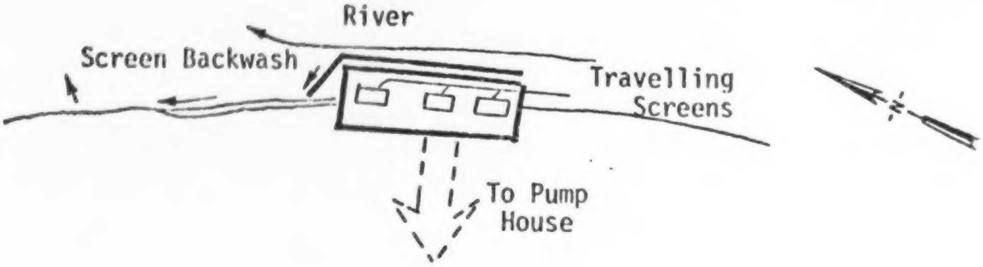
The 011 and 012 Outfalls are only about 10 feet apart where they enter the River. Both were submerged during our inspection of the week of September 22, 1975. Both are generally above River level which was the situation observed during the EPA river boat run of June 21, 1975. USSC customarily samples both via drop bucket off the River bank. At normal River stage, the two outfalls could be sampled by NEIC by boat from the River side. These sewers intersect the River at the rear of the Maintenance Shop, i.e. a brick building directly abutting a white building close to the point where an overhead line from the Duquesne mill joins onto a Clairton oxygen(?) line suspended at the top of the River bank (as reported by USSC). The 012 Outfall is an arch brick sewer as observed at the River. Both the 011 and 012 Outfalls contain sizeable wastewater flows.

Central Boiler House Located Between Linde Oxygen Plant (on the North) and No. 4 Blast Furnace (on the South)

Boiler feed supply receives treatment by lime and hot soda addition, settling and filtration. Boiler house condensates and/or blowdowns apparently are routed to either the 011 or 012 sewer systems but it is not clear which. High and low pressure steam are produced, respectively at 250 pounds and 130 pounds.

Plant Water Intake and Pumping Station

The Duquesne Plant water works and screen backwashes are located upstream of both Outfalls 011 and 012, more or less to the rear of the Central Boiler House. The River water is brought in through coarse bar screens followed by three travelling screens in parallel. After passing through the screens, the water is directed into two channels. Screen backwash exits from the pump intake station via two launders which combine into a single launder before cascading into the River. The flow schematic is shown on the following page. A walkway is available enabling sampling and flow measurement of the screen backwash, if desired. Abundant water was being used for screen backwashing



purposes during our visit. Only one of the 3 travelling screens was going the day of the inspection. USSC has no discharge application for this screen backwash.

The water intake pump house was located directly west of the intake structure. Eight pumps are more or less available. Pumps Nos. 1 and 2 on the north side of the pump house are both electric each rated at 15,000 gpm. Pumps 4, 5, 6 and 7 in the middle area of the pump house are steam-driven and have a capacity rating of 25,000 gpm each pump. Pumps 8 and 9 on the south side of the pump house are either steam or electric (presumably one of each) each having a full rating of 36,500 gpm. Total maximum pumping capacity (from the above figures) equates to 173,000 gpm = 250.7MGD. During our inspection, pumps in operation included Nos. 1, 4, 5, 7 and 8. Charts attached to each of the pumps provided actual flow rates as follows:

No. 5 Unit - 15,000 gpm
No. 7 Unit - 14,500 gpm
No. 8 Unit - 15,000 gpm
No. 4 Unit - 15,000 gpm
No. 1 Unit - 14,000 gpm
Total = 73,500 gpm ~ 106.5 MGD (checks reasonably close vs. waste discharge total of 107.5 MGD given by Weiskircher).

Pumps Nos. 1 and 2 are said to principally serve the blast furnace area of the Duquesne Plant. Pumps 8 and 9 appear to principally serve the Linde Oxygen Plant. For purposes of calculating Net NPDES permit loads at Duquesne, the Company samples off the discharge side of No. 5 (No. 4?) Pump. A spigot is available which is left open a short time before sampling. A similar sampling spigot is reported off the No. 1 Pump. USSC usually collects 50 cc composite samples (every 13 minutes reported) via a Pro-Tech automatic sampler or equivalent devise. Except for the water intake samples and 112 samples (if and when taken), all other self-monitoring sampling by USSC is believed to be by grab means. Parameters of concern on the water intake include TSS and Oil/Grease. Venturi flow tubes are thought to be available for each pump. In addition to the above, city water is used at the Duquesne Plant but rates were unknown at the time of our visit. City water is thought used for sanitary needs but for little else at USSC, Duquesne. On the other hand, sanitary wastes from the Duquesne Plant are said to be completely segregated and received and treated by the Sanitary Authority of the City of Duquesne.

013 Outfall and Various Blast Furnace Cooling Waters

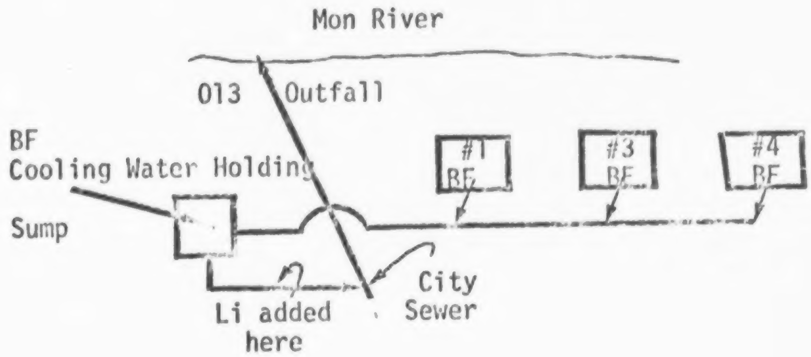
Outfall 013 serves to collect various cooling water flows from the Nos. 1, 3 and 4 Blast Furnaces plus an unspecified flow via an unidentified city storm sewer thought to be entering the top end of the 013 drainage network. Sketches accompanying the NPDES draft permit describe the 013 Outfall as containing 12.5 MGD made up of 4.0 MGD from Blast Furnace Unit No. 1, 4.0 MGD from Unit No. 3, and 4.5 MGD from Unit No. 4. The Fact Sheet attendant to the NPDES permit however summarizes the 013 Outfall as discharging only 6.8 MGD. We were unsuccessful in locating any access manhole on the upstream storm sewer anywhere on Steel property. In later discussion with city people, Friday afternoon, September 26, it was indicated to us the sewer in question may be the Wyle Ave. sewer proceeding east down the hill, making a left angle turn at Duquesne Ave. and shortly thereafter cutting through Steel property more or less under Camp Avenue. City personnel cited the terminus of this sewer as being egg-shaped which is true of the 013 Outfall. The city completely disavowed any responsibility whatsoever for any and all storm sewers once within the property confines of USSC. Weiskircher described the 013 Outfall as presently running in the order of 5.0 MGD. Company lithium chloride measurements have given flows from 2 to 8 MGD.

It was previously mentioned that the steel mill water treatment plant is tributary to the 013 sewer. Water treatment plant sludge and other discards are added to the 013 sewer upstream of the Blast Furnace cooling water line. The WTP consists of five outside chemical mix tanks plus seven rapid sand filters in a closed building. Treated water is currently estimated around 1.6 MGD and is destined for use in the Duquesne boiler house.

Of the 5 large tanks, each of 539,000 gallon capacity, 4 are employed for chemical mix and treatment, and the fifth is used for water storage. The chemically-treated waters are allowed to settle in the same tank, the waters then decanted and sent through the sand and gravel filters. The Company presently utilizes three of the chemical mix tanks;

these are strictly operated on a batch basis. The water treatment tanks are said to be blown down once weekly, but more frequent blowdown is highly likely. Concerning the various sand filters, the No. 1 unit appeared to be permanently out of service, and No. 8 was never installed or had been previously removed. Of the remaining six filter units, two were in full use and one on full standby during our inspection. The treatment plant operator stated that tannic acid coloring in the water was relatively high the end of September 1975. He is presently backwashing the filters twice a day with these spent flows going to the 013 sewer network. The operator according to his observations indicated on September 25 the River stage had come up about 6 feet over previous conditions.

EPA, Region III has apparently given preference for sampling the excess blast furnace cooling water flows after the small holding sump but before the 013 storm sewer as depicted below. USSC is adding lithium



chloride to the overflow from the BF cooling water sump.

Major Company sampling is performed at the end of the 013 sewer. A ladder is available enabling one to reach the very end of the sewer. This sewer may possibly be rated by walking into the sewer a short distance and installing necessary equipment. The 013 Outfall is oval or egg-shaped approximately 7 ft. high by 4 1/2 ft. across at its widest point. Depth of flow was judged about 6 inches. During the EPA river boat run of June 21, the outfall was high and dry, whereas the week of September 22, 1975, the sewer was only a few inches above the level of the River. The outfall was observed to have good flow. The 013 line enters the River to the rear of the north end of the lime storage (white) building at the end of the concrete wall set in place on top of the river bank.

BOP Shop and 014 Outfall

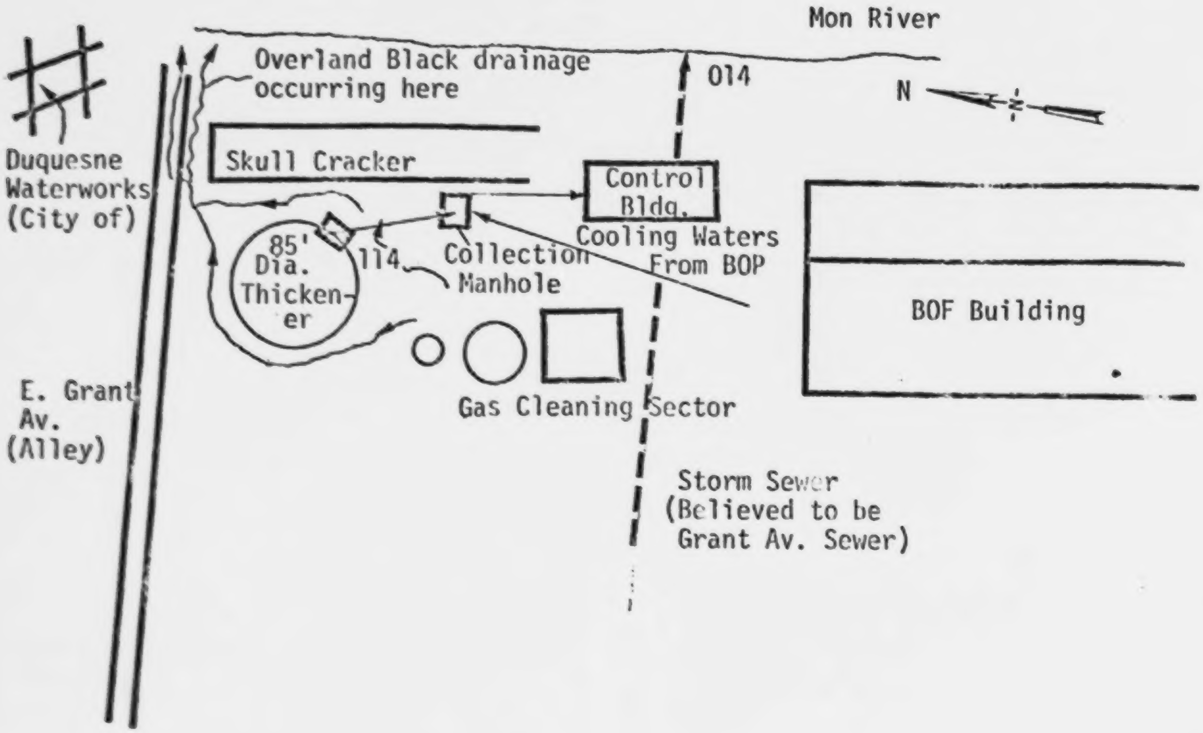
The draft NPDES permit and support materials describe the 014 Outfall as containing 8.0 MGD wastewater flow arising as 6.9 MGD cooling waters from

BOP operations and 1.1 MGD gas cleaning flows being treated in a thickener-clarifier before release to the 014 sewer. Weiskircher during our inspection visit indicated the 8.0 MGD was a reasonably good flow figure as confirmed by USSC lithium chloride measurements. During the week of September 22, 1975, we also learned a Grant Avenue city storm sewer apparently ties into the 014 Outfall.

At the time of BOP construction, various USSC design data were calling for annual production of 1.5 million tons steel. Assuming 350 production days, this equates to 4,300 TPD steel. Assuming 5 days operation per week, average steel production would be 5,770 TPD. These numbers compare to the capacity production figures 8,100 TPD BOP steel given in the NPDES draft permit. Current (Sept. 1975) production is probably not much more than 1/2 the capacity levels. Heat time or tap to tap time on the basic oxygen furnaces ranges from 40 to 50 minutes depending upon the type of steel being produced. The oxygen lance blowing time is about 20 minutes per heat. Percent molten metal into the Duquesne BOP Shop runs around 85 percent. From the mouth of the BOP kettle, gases are collected into a water-cooled hood and sequentially cooled by sprays in a quenching chamber.

Data given the State in the mid-1960's describes the cooled gases as being carried over to the gas cleaning plant directly adjacent to the BOP building. According to this information, the gases pass through dual venturi scrubbers in parallel. Ahead of or synonymous with the venturis is a standpipe serving as a small settler and recycle point. Overflow from the standpipe is routed either to the quenching chamber, the venturis or River discharge; and underflows are pumped to a following thickener-settler. Venturi scrub waters are sent to the thickener-clarifier but some flows may be recycled ahead of the thickener back to the venturis. At the time of design, approximately 600 gpm was said to be entering the thickener but to accommodate expansion, the unit was eventually designed to receive 1750 gpm = 2.54 MGD. Sludges off the bottom of the thickener are received into two drum-type vacuum filters, with filtrates being returned to the settler.

The BOP thickener unit is 85 ft. in diameter x 8 ft - 8 in. SWD and providing a detention of 4.3 hours at 2.54 MGD. Influent to the thickener was expected to contain around 27,200 mg/l TSS and the effluent less than 100 mg/l TSS. No chemicals are reported added to the BOP thickener. Filter cake from the vacuum filters was designed to be reused at the sinter plant or stored for future reclaiming. This filter cake is presently being deposited onto the ground below the filter house and being subjected to yard runoff and washdown. The filter cake is currently being trucked in semi-wet form to landfill. During our inspection overland runoff was occurring from the BOF sector and finding its way down the hill into the Mon River at the base of Grant Avenue. Initially it was thought an oil spill had taken place because of the intense black color of the runoff. Approximately 10-15 minutes after this observation was reported to Weiskircher, the flow stopped. A schematic of this process sector is depicted on the following page.


Mon River
Overland Black drainage occurring here
014
N
Duquesne Waterworks (City of)
Skull Cracker
Control Bldg.
Cooling Waters From BOP
85' Dia. Thickener
114
Collection Manhole
BOF Building
E. Grant Av. (Alley)
Gas Cleaning Sector
Storm Sewer (Believed to be Grant Av. Sewer)

USSC has added lithium chloride to the launder of the 85 ft. diameter BOP thickener and measured salt concentration at the Collection Manhole in order to obtain estimates of thickener overflow. The Company collects samples out of the final effluent launder on the south side of the thickener and this point is known as Sampling Location 114 in the draft NPDES permit. This sampling point is approximately 50 feet from the collection manhole. Flow values by USSC at the 114 location (1-2 x per month) have ranged from 2.0 to 2.2 MGD.

USSC has also added lithium chloride at the above-mentioned manhole and subsequently measured the salt concentration at the terminus of the 014 Outfall for estimating total flow in the 014 Outfall. The 014 Outfall flows have ranged from 7.9 to 8.2 MGD. For self-monitoring purposes, the Company generally samples 014 at the end of the pipe below the River bank via drop bucket (± 40 ft. drop). This outfall at the River is situated about 200 ft. north of the north end of the BOP building. Outfall

014 was freely discharging (and thereby accessible in spite of high River stage) during our inspection visit of the week of September 22, 1975. This point may best be sampled by boat during any future NEIC survey. A short distance downstream of the 014 Outfall is located a floating dock for off-loading fuel oil into the Duquesne Plant, then East Grant Avenue, followed by the City of Duquesne Waterworks. The waterworks will be described later in our report.

We searched for a suspected manhole thought to be existing near or within the control-electrical building just north of the BOP shop said to be placed over the Grant Avenue storm sewer line, but were unsuccessful in locating such access point.

Significant floating metal particles were very much evident walking around the BOP operations and gas cleaning facilities. The floating particles are thought to constitute a safety hazard to anyone without shop-type safety glasses.

Miscellaneous Activities Including Skull Cracker, Off-Load Fuel Oil Station, and Duquesne Waterworks

The Skull Cracker facility takes old and/or obsolete ingot molds, thimbles, bottoms, etc. and breaks these articles into scrap metal for eventual reuse and manufacture of steel.

The fuel oil receiving floating dock at Duquesne is moored offshore in the River just about at the end of Grant Avenue if this road were extended. We noticed oil boom spread on the shoreline just down river of Grant Avenue and considerable oil boom footage stored in the alley between the Skull Cracker and the City of Duquesne water treatment plant. At the foot of the alley and the NW corner of the moored dock we observed an open pipe ashore fairly well hidden but not flowing USSC personnel could provide no information on possible waste source contributions, if any, to this potential outfall. The blackish discharge previously described as coming from the BOP area, was finding its way to the River at almost the precise location of this outfall pipe.

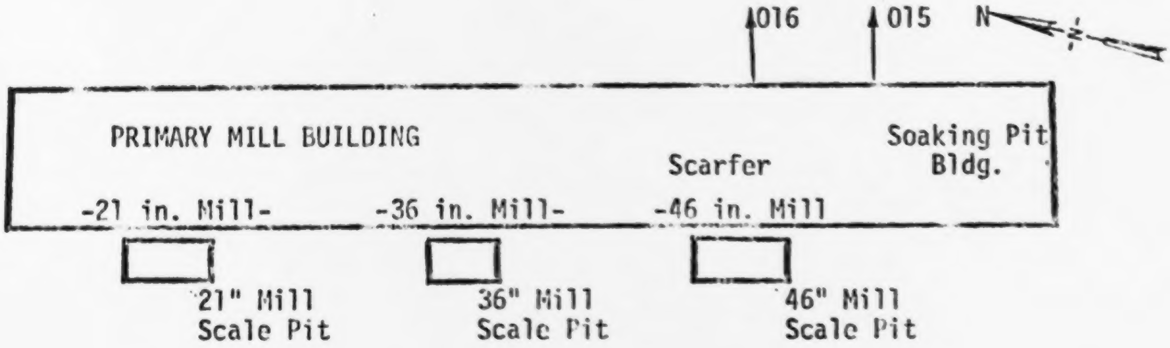
The Duquesne Waterworks is uniquely located at the center of USSC, Duquesne property. Weiskircher was not positive but believes Duquesne owns the small sector of land upon which their water treatment plant is located. Water is received from a series of artesian wells located at and alongside the River shoreline. We observed some of these wells in the vicinity of Outfalls 015 and 016. Preliminary information obtained from the city indicates about 1.5 MGD water are treated at this site by means of lime chemical addition, settling, multi-media (i.e. sand-gravel-charcoal) filtration and chlorination. Mr. Ray Mickle is the Plant Superintendent. We were unable by visual sighting to determine the point whereby blowdowns, filter backwashes, etc. are discharged from the water plant into the Mon River. During our USSC inspection, the River was highly turbid making such sighting difficult. This discharge may be offshore a significant distance. Additional data is sought from the city.

Outfall 015 Containing Scale Pit Effluents from the 46-Inch, 36-Inch and 21-Inch Primary Rolling Mills

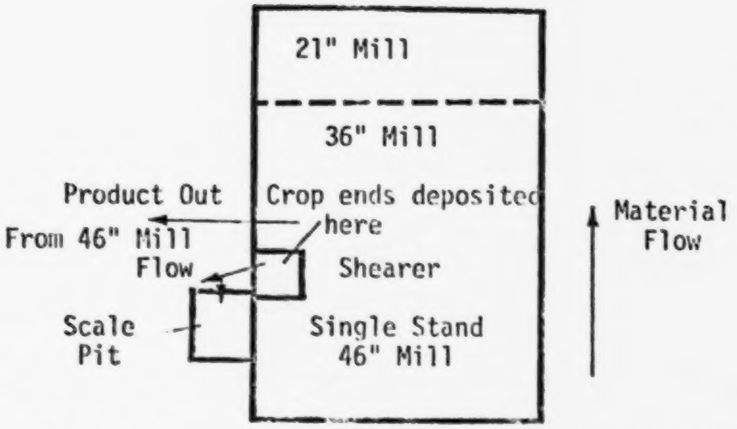
The draft NPDES permit Fact Sheet and technical rationale show a combined waste flow through the 015 Outfall of 22.7 MGD whereas our calculations describe a total flow of 15.8 MGD made up of 11.0 MGD from the 46-inch mill, 2.5 MGD from the 36-inch mill, and 2.3 MGD from the 21-inch mill. Weiskircher, the week of September 22, 1975 indicated a probable 015 flow rate around 22.0 MGD. The Company determines waste flow both by using lithium chloride and the Manning formula and applying all necessary calculations at the end of the 015 line. This outfall is generally above the normal River stage. Flow values determined by USSC in August 1975 were 15 MGD and 27 MGD. Capacity production for the three mills has been given previously as 5,000 TPD hot formed billets and blooms, but not infrequently,hot-formed slabs are rolled mostly destined for the USSC Homestead Mill. We were not able to obtain separate production for each of the three mills although production of the 46-inch mill is undoubtedly the highest. It was reported that approximately 34% of the 46-inch mill production on an average basis is passed through the automatic scarfing machine. The degree of scarfing seems to depend mostly upon customer specifications. Automatic scarfing is a relatively quick operation requiring 30 seconds or less. The outer surface of the steel is burned off with an acetylene-natural gas mixture producing an intense blue-white, very hot flame.

The primary rolling mills are preceded by a total of 32 soak pits. The 46-inch mill comprises essentially a reversing, 2-high stand; the 36-inch mill, a reversing 2-high stand mostly turning out 12 to 13 inch square billets; and the 21-inch mill is a 4-stand, straight-through finishing facility. Most of the steel finished out of the 46-inch mill consecutively then passes through the 36-inch mill.

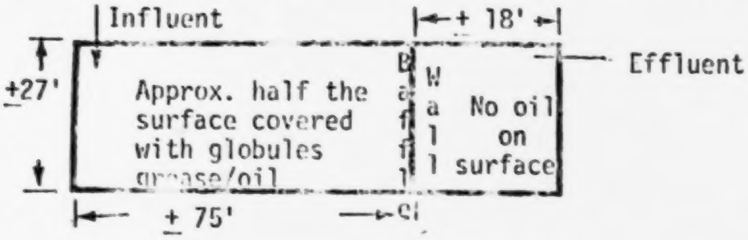
On Friday, September 26, we passed through the multi-pass, single-stand 46-inch mill which was manufacturing slabs at the time of our inspection. The three mills are roughly configured as follows:


016
015
N
PRIMARY MILL BUILDING
Soaking Pit Bldg.
Scarfer
-21 in. Mill-
-36 in. Mill-
-46 in. Mill
21" Mill Scale Pit
36" Mill Scale Pit
46" Mill Scale Pit

Another layout of the primary mill building especially the 46-inch mill is given below:


21" Mill
36" Mill
Product Out
From 46" Mill
Crop ends deposited here
Flow
Shearer
Scale Pit
Single Stand 46" Mill
Material Flow

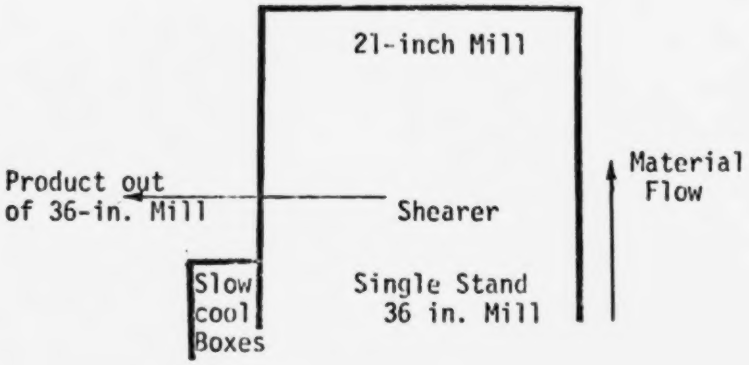
Plan view of the 2-sompartment, 46-inch mill scale pit is illustrated:


Influent
± 18'
Effluent
±27'
Approx. half the surface covered with globules grease/oil
Baffle
Wall
No oil on surface
± 75'

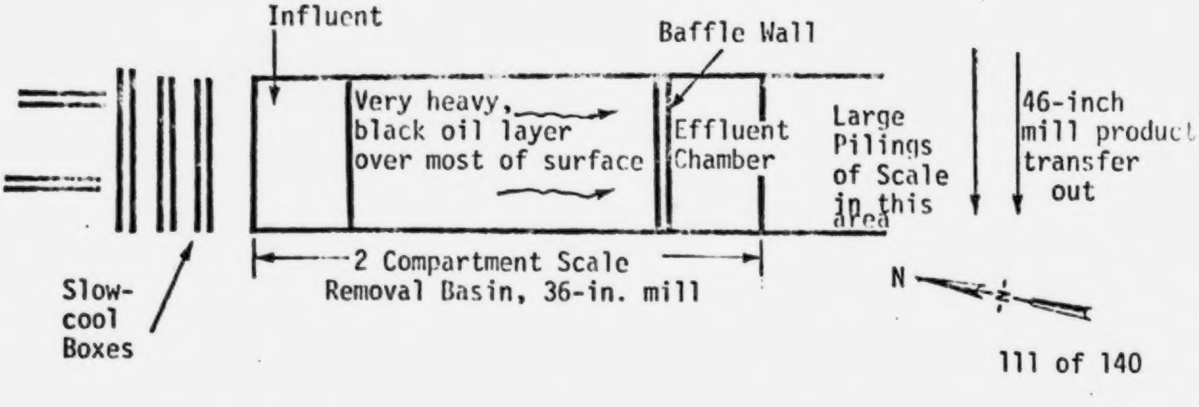
Water level in the 46-inch mill scale appeared to be at least 40 ft. down from the top wall. Judging by previous dredgings of the basin deposited alongside the pit, it is judged the basin had been cleaned in the last day or two. This basin is not equipped with any type of oil skimmer and USSC personnel indicated the old skimming assembly had been removed. Depositing the scale and debris removed from the pit onto the ground would seem to constitute poor waste management and control practice.

According to design specs within the State files, this scale pit is 83 ft. x 25 ft. x 14 ft. deep; is designed to receive a flow of 6,700 gpm = 9.64 MGD; and provide a waste detention time for this flow of 32.5 minutes. The original design specs call for oil skimming facilities to be present on each of the three scale pits at the primary rolling mills.

Continuing down through the 36-inch mill, processing was intermittent; plan views of the 36-inch mill and its scale basin are given below:


21-inch Mill
Material Flow
Product out of 36-in. Mill
Shearer
Slow cool Boxes
Single Stand 36 in. Mill

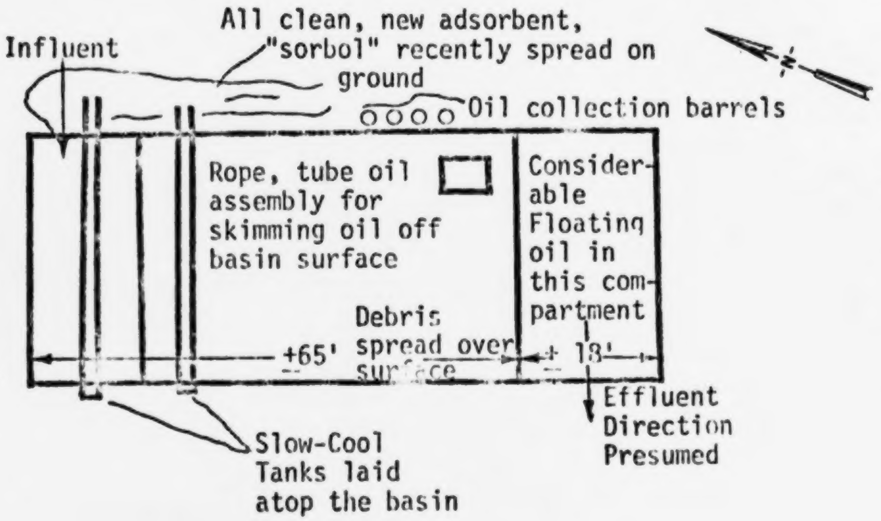
The 36-inch mill scale pit is illustrated in the following. Design specs contained in the State files indicate the 36 inch mill scale basin is 75 ft. x 25 ft. x 9.5 ft. deep, is intended to handle a process waste flow of 4,000 gpm = 5.77 MGD, and provide a waste detention time of 33.4 minutes. This basin appeared to be at least 40 feet down to water level. There was no oil skimmer on the 36 in. mill basin, and we were told this device had been transferred to the 21-inch mill basin. The Slow-Cool


Influent
Baffle Wall
Very heavy, black oil layer over most of surface
Effluent Chamber
Large Pilings of Scale in this area
46-inch mill product transfer out
2 Compartment Scale Removal Basin, 36-in. mill
Slow-cool Boxes
N

boxes referred to in the schematic are used for controlled cooling of the semi-finished, hot-rolled steel pieces. Heated gas is bled into the tanks to enable slow cool-down at intermediate temperature levels.

We next viewed the 21-inch mill which was rolling square cross-section bars approximately 18 to 20 ft. long via a 4-stand mill assembly, followed by a flying shear, the pieces being arranged in parallel at the end of the line before product transfer outside the mill building. Immediately following the 4-stand assembly, the product can be cut apart either by the flying shear or cold saws on an alternate parallel line. The cold saws were not operating during our inspection visit. The 21 inch mill scale basin is configured below. According to design specs in the State files, this scale basin is approximately 62.5 ft. x 25 ft. x 13.5 ft. deep. We note that field-derived dimensions do not correspond to the design data. Design flow was given as 5,000 gpm = 7.2 MGD and the facility was intended to provide a waste detention of 31.6 minutes. From our field observations, depth to water level in the basin was judged to be about 40 feet. The plant operator present during our inspection of the 21-inch mill said "Sorbol" has been put down on the ground, the day prior to our visit because one of the (55 gal.) collection barrels had overflowed. The collected waste oil is screened by the scavenger picking up the oil and subsequently sent to a re-

21-inch Mill Scale Pit.


All clean, new adsorbent, "sorbol" recently spread on ground
Influent
N
Oil collection barrels
Rope, tube oil assembly for skimming oil off basin surface
Considerable Floating oil in this compartment
Debris spread over surface
±65'
±18'
Effluent Direction Presumed
Slow-Cool Tanks laid atop the basin

refiner. The oil skimming device has been in place in the 21-in. mill basin approximately 2 months and is made by Oil Skimmer, Inc. out of Cleveland, Ohio. USSC still considers this device an experimental unit. Roughly a barrel of oil is collected every second day. Nylon or polypropylene tubing (3/4 in. dia.) or equivalent impregnated with oil is vertically brought up and around a pair of wheels. A scrapper arm wipes off the oil into a box receptacle, the oil then flowing into a receiver barrel.

Concerning the primary rolling mill scale pits, the scale is said to be removed approximately once a week by clamshell, generally on Thursdays. The recovered scale is reported to be taken to the Saxenberg sinter plant or direct to blast furnaces. With reduced production, frequency of scale cleaning may be further reduced. Blast furnace operators prefer not to receive this material. USSC themselves profess the need for better recovery efficiency of oils. The bar mill scale pit was said to experience greater amounts of oil than the primary rolling mill scale basins.

The 015 Outfall at the River was viewed both from on top and below the River bank. The plant has the habit of stringing a long line of railroad cars in front of the 015 and 016 Outfalls thereby effectively blocking access to 015 and 016 from above. The 015 Outfall can however be reached from below by walking a considerable distance along the shoreline from the Duquesne Waterworks down river. The 015 Outfall in spite of high River stage was freely discharging during our visit. This outfall exits out of a 5 ft. diameter pipe onto a concrete apron and has a reasonably heavy flow. Depth of flow was estimated around 12 inches but velocity was extremely high. A ladder is available for negotiating the River bank down to the 015 (and 016) Outfall when the railroad is not blocked. The 015 Outfall is directly below a concrete abutement structure along the tracks. One of city's artesian wells is situated a short distance upstream of 015 on the shoreline.

USSC measures flow at 015 both by the lithium chloride technique and the Manning formula. Lithium chloride is generally added at the 46-inch mill scale mill and measured at the end of the outfall. The 015 Outfall is usually sampled by USSC at the end of the pipeline close to the River but in the event the River stage is extraordinarily high, the sampling point is moved back up the 015 sewer to a manhole immediately west of the railroad tracks. The manhole was judged to be approximately 30 feet to water level. At the River we observed that Outfalls 015 and 016 are only about 70 feet apart. Outfall 016 reached off the same ladder as 015, was apparently submerged during our visit of September 26.

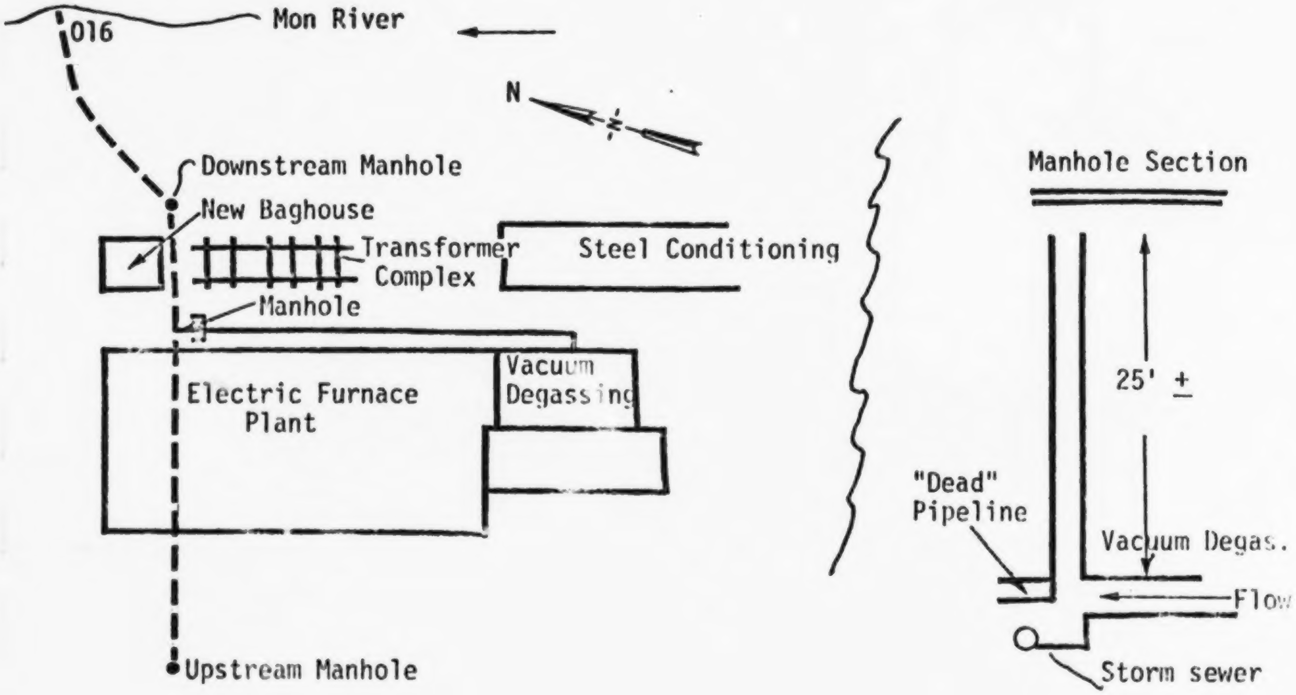
016 Outfall - Electric Furnaces and Vacuum Degassing

For various reasons, we visited neither the electric furnace building nor vacuum degassing operations the week of September 22, 1975. Capacity production has been given as 800 TPD for electric furnace steel production. We were not able to collect any production figures on vacuum degassing. Stainless is made in the electric furnace shop but lately stainless manufacture has been minimal. The stainless when present eventually finds its way through the primary mills and the No. 5 Bar Mill at Duquesne.

The NPDES draft permit and various support materials cite wastewater flows of 5.3 - 5.8 MGD for 016. Weiskircher, the week of September 22, 1975 stated that average flows for this sewer network may be as high as 6.0 MGD. In August, 1975 the flow for 016 was 5.3 MGD. The 016 line receives up to 3.2 MGD cooling waters from the electric furnace shop, together with 2.1 MGD vacuum degassing condensate process flows, plus whatever flow may be present in an upstream city storm sewer intersecting USSC property. The latter believed to be either the Hamilton or Whitfield Street sewer. We note that directly SE of the Electric Furnace Shop is located the Steel Conditioning Plant and directly east of this is located two 4 MG Fuel Oil storage tanks. The Steel Conditioning Building is the site of three grinding machines cited previously in this report as contributing to significant air pollution. Fortunately no water is used and the latter building is reported to have zero wastewater discharge. The Fuel Oil storage tanks are relevant to the 016 Outfall in that 016 Outfall was the announced site of a previous severe oil spill caused by a break from the fuel oil storage area. Partial evidence of this spill is still remaining in the River bottoms area at 016.

Vacuum degassing process waters are said to originate from two units. Steam is used to pull vacuum and materials are apparently condensed via barometric(s) yielding the subject waste stream. Vacuum degassing is described as a highly intermittent operation perhaps 1-2 hours daily but then again not every day. A vacuum cast per se requires only about 10 minutes. Cooling waters from the five electric furnaces are classified by Steel as NCCW.

We inspected a manhole on the NE side of the electric furnace building said to be carrying only vacuum degasser water flows just before entering the Hamilton or Whitfield Street sewer. This connection is shown on the following page. A reasonably strong flow was present in this line.


Mon River
016
N
Downstream Manhole
New Baghouse
Transformer
Complex
Steel Conditioning
Manhole
Vacuum
Degassing
Electric Furnace
Plant
Upstream Manhole
Manhole Section
25' ±
"Dead"
Pipeline
Vacuum Degas.
Flow
Storm sewer

This particular manhole contains only vacuum degasser steam condensed flows, has been used by Steel for lithium chloride additions, but no samples have been collected from this point.* The baghouse adjacent to the electric furnace building is served by 3 "dirty air" delivery system with fans. The total air flow passing through 24 baghouses is given as 1,712,000 acfm.

The next downstream manhole on 016 represents the only access point to the 016 line between the River and the baghouse station. This manhole is located directly in back of and east of the baghouse complex, is quite deep i.e., 30-40 feet, and contains extremely fast-moving flows. This manhole ∿ 2.5 ft. diameter is reported to be used by USSC both for lithium chloride addition and for waste sampling (contains the entire 016 flow). Since the end of the 016 sewer at the River is submerged during all but the driest of weather conditions, the MH east of the baghouse is used for self-monitoring sampling. This MH is also deployed as the measurement point for lithium chloride added at the vacuum degassing MH. It also becomes the lithium chloride addition point when it is possible to measure lithium chloride down at the River.

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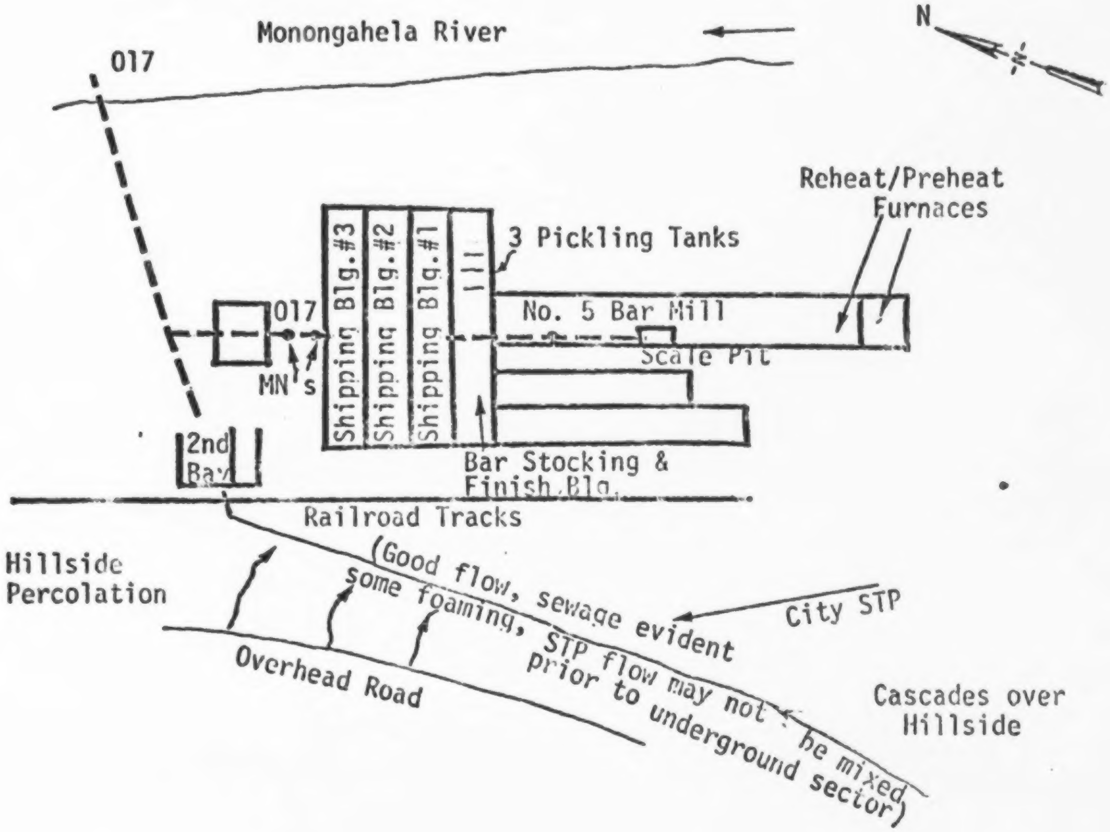
*Draft NPDES seems to specify this location for collection of self-monitoring data.

As mentioned previously, 016 is not accessible from the top of the River bank whenever a string of railroad cars is placed in front of the 015-016 Outfalls, which apparently is fairly frequent. On September 26, upon descending the ladder down to River level, we were able to see little tangible evidence of the 016 discharge (which was completely submerged) except possibly for an oil sheen in the proximity of the outfall. During the EPA river boat run of June 21, 1975, the 016 outfall was hidden in a grove of trees, its precise location not known at that time, and was thereby visually undetected.

We searched for and finally located an upstream storm sewer control on the 016 Hamilton Street sewer inside of USSC property just south of the Hamilton Street plant gate. This manhole is in a parking lot on line and 126 feet south of the gate house and on line and 80 ft. north of a Kentucky Fried Chicken establishment on the main road. The MH is just a few feet off an access road inside the parking lot. Unfortunately we could not raise the MH cover because an automobile was striding the manhole.

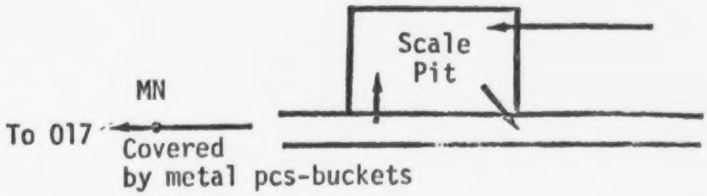
017 Outfall Serving USSC No. 5 Bar Mill, Heat Treating and Finishing, and Thompson Run Drainage which in Turn Receives City of Duquesne STP Effluents.

U.S. Steel measures its 017 contribution via an internal plant sewer at a manhole a few hundred feet from the Thompson Run Culvert running underground through USSC property. The 017 sampling location is on the main plant sewer south of a series of office buildings but also directly north of Shipping Building No. 3 and the No. 5 bar mill and heat treating and finishing facilities. The draft NPDES permit and support materials lists 017 as comprising 5.1 to 5.7 MGD waste flow whereas Weiskircher, the week of September 22, 1975 cited a flow for 017 of 6.5 MGD. The permit further lists capacity production of 1,100 TPD hot forming at the No. 5 Bar Mill. Virtually no other process information was provided in the permittee's application on the 017 waste system. Flow schematics from the permittee shows 3.0 MGD process waste flows from a scale pit at the No. 5 bar mill; 2.5 MGD untreated process flows originating from heat treating, and 5.8 MGD at the terminus of the Thompson Run Sewer at the River. A schematic of this system is depicted on the following page.


Monongahela River
N
017
Reheat/Preheat Furnaces
3 Pickling Tanks
Shipping Blg. #3
Shipping Blg. #2
Shipping Blg. #1
017
No. 5 Bar Mill
Scale Pit
MN's
2nd Bay
Bar Stocking & Finish Blg.
Railroad Tracks
Hillside Percolation
(Good flow, sewage evident some foaming, STP flow may not be mixed prior to underground sector)
City STP
Overhead Road
Cascades over Hillside

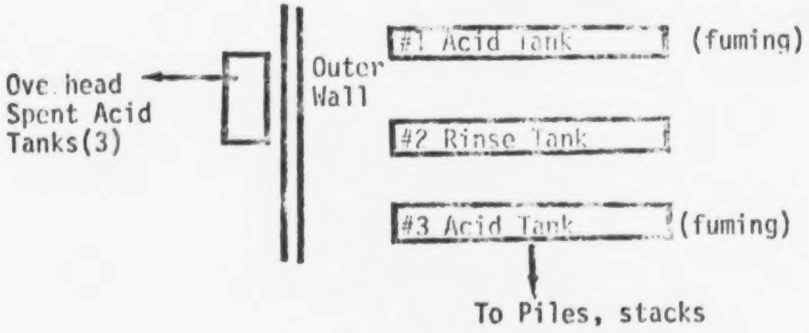
Major processing reported on the 017 sewer line comprises the No. 5 Bar Mill. The bar mill consists of 2 finishing stands together with cold saws. The first stand is probably a 3-high reversing mill machine; we counted five passes through the first stand. In our walk through the bar mill, a descaling machine was believed present. Cold saws serve to cut the steel sections into the desired lengths. Both square and rounded cross-section finished steel were seen.

The scale pit at the No. 5 bar mill, from specs in the State files, is approximately 20 ft. x 10 ft. x 4 ft. - 6 inches deep. At a maximum flow rate of 3900 gpm = 5.62 MGD, waste detention time would be 1.7 minutes. Flows from the No. 5 bar mill appear considerably lower than the cited design values. The scale pit is roughly configured on the following page. No oil skim device was seen. A manhole on the NW side of the No. 5 bar mill has been used for lithium chloride addition but during our inspection, the MH was covered by four buckets containing crop ends. Depth to water level in the MH is reported as 30 ft. or greater. Lithium chloride


Scale
Pit
MN
To 017
Covered
by metal pcs-buckets

can also be added at a MH on the north side of Shipping Building No. 3, and subsequently measured at the (bottom) 017 MH east of the office buildings (see sketch).

Inside and at the east end of the Bar Stocking and Finish building we inspected bars and/or rounds undergoing "brightening" via pickling in a series of three tanks, two containing sulfuric acid and a third serving as a rinse vat. A 15 ton crane is used to convey bars and rounds (20 to 30 pcs. at a time) in and out of the tanks as illustrated. We witnessed rounds being dipped in Tank No. 1 followed by rinsing in Tank No. 2,


Overhead
Spent Acid
Tanks(3)
Outer
Wall
#1 Acid Tank
(fuming)
#2 Rinse Tank
#3 Acid Tank
(fuming)
To Piles, stacks

the pieces being carried to the west side of the building, piled, and air dried. There was considerable spillage of acid over the sides of Tank

No. 1 when the crane load was immersed into the vat. The pieces being withdrawn from the No. 2 Rinse Tank were receiving further rinsing by manual hosing-down of the various steel pieces while still suspended from the crane. Acid rinses and escaping spent acids plus scale presumably all end up in the main sewer leading to 017. Concentrated spent acids are pumped outside to three overhead storage tanks. This spent acid is eventually disposed of by scavenger service. We could obtain no further details on the pickling of steel. Pickling operations had not previously been reported by the company to Region III.

Across from the No. 5 Bar Mill, cursory inspection was made of Quench and Temper lines inside the Heat Treating and Finishing buildings primarily for the final finishing of Duquesne rounds and bars. Operations mostly consist of contact quenching. A G.E. Quench line was seen on the east side of the "Heat Treating and Finishing Facility" building involving oil and water quenching. On the far or west side of the same building was installed a "Salem" Quench line involving water quench only. Steel personnel report that there is complete recycling of oils used in the Quench circuits. A "Rust" Quench line was seen on the north side of the building but this system was said to be no longer in use. These conditioning or quench waters bypass any and all scale pits and flow more or less directly to the 017 main plant sewer. General practice is to quench the pieces being treated in oil or water bath, reheat the steel sections, then slow cool and/or anneal in annealing boxes or equivalent. Only a small part of National-Duquesne bars apparently pass through this heat treating plant.

According to city personnel at the Duquesne secondary STP, Thompson Run Culvert can be walked the entire length underground. City perseonnel indicate there are multiple discharges from USSC into Thompson Run Culvert besides the known plant sewer described by Steel as the 017 line. During the week of September 22, 1975, the terminus of the Thompson Run Culvert was stated as definitely being submerged by the Mon River. At the time of the EPA river boat run on June 21st, this culvert was fully open and flowing freely. In June 1975, considerable scale solids buildup was noted at the end of the culvert deposited across a fan-like delta on the shores of the River. Steel reports previous scale cleanout of the bottom end of Thompson Run Culvert. This relatively large outfall is roughly situated below the RR tracks and River bank a few hundred yards SE of a RR terminal complex on the Steel side. Also across the River and slightly upstream of 017, we noted a yellow-black floating caisson box which should serve to further locate this outfall. NEIC sampling is indicated at the end of this outfall during reasonably dry weather. Detailed data should be secured from the city on characteristics and flow magnitude of discharges coming from both the municipal STP and the Waterworks.

The manhole cover was raised on the Company's 017 sampling point. This manhole is located on the main plant sewer serving the No. 5 Bar Mill and associated heat treating facilities and directly south of an office complex otherwise identified as a "dirty" yellow building. The manhole was judged perhaps 30 ft. deep containing relatively high levels of volatile solvents or equivalent. This manhole is located directly in the sidewalk leading up to the fore-mentioned building(s).

Downstream Water Supplies

The North Versailles water supply is reported directly across the River from the USSC, Duquesne steel works. The city of Duquesne withdraws its water supply at almost the same location but from a series of moderate-depth artesian wells. The next downstream water supply that possibly could be impacted by the USSC, Duquesne discharges is the Borough of Braddock about one mile downstream. Braddock provides softening, filtration and chlorination of its supply.

SUGGESTED SAMPLING POINTS FOR PROSPECTIVE NEIC FIELD SAMPLING OF USSC, DUQUESNE STEEL MILL, DUQUESNE, PA.

Primary Locations

Station 111, effluent from thickener treatment of Blast Furnace wet scrubbing waters, at final collection point in launder of the 90 ft. diameter thickener.

Station 211, granulated slag pit overflow from No. 4 Blast Furnace unit, at Company manhole SE of granulated slag basins.

Excess cooling waters from Blast Furnace Nos. 1, 3 and 4 at cooling water holding sump north of BF No. 1 and east of Water Treatment Plant prior to entry into 013 sewer.

011 Outfall at River (2)

012 Outfall at River (2)

Water Intake off discharge side of No. 5 Pump at Water Intake Pump House.

013 Outfall at River (2)

114 effluent from thickener treatment of BOP wet scrubbing waters, at final collection point in launder of the 85 ft. diameter thickener.

014 Outfall at River (2)

015 Outfall at River (2)

016 Outfall at manhole downstream of baghouse on electric furnace building. (1)

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(1) This outfall at River normally submerged in part or all.
(2) This sampling point or outfall not affected by River stage during reasonably dry weather.

Thompson Run just prior to its entering USSC property and entering underground culvert.

017 at Company sampling point, i.e. manhole south of office buildings on main plant internal sewer.

Thompson Run Culvert at mouth, i.e. intersection with River. (2)

Secondary Locations

Station 112, slag pit overflow from No. 1 Blast Furnace

Center Street storm sewer in area of old (?) pig casting machine

Upstream control on storm sewer contributing to Outfall 013

Upstream control on Grant St. storm sewer

Upstream control on storm sewer contributing to Outfall 016, presumed to be either Hamilton St. or Whitfield St. storm sewer.

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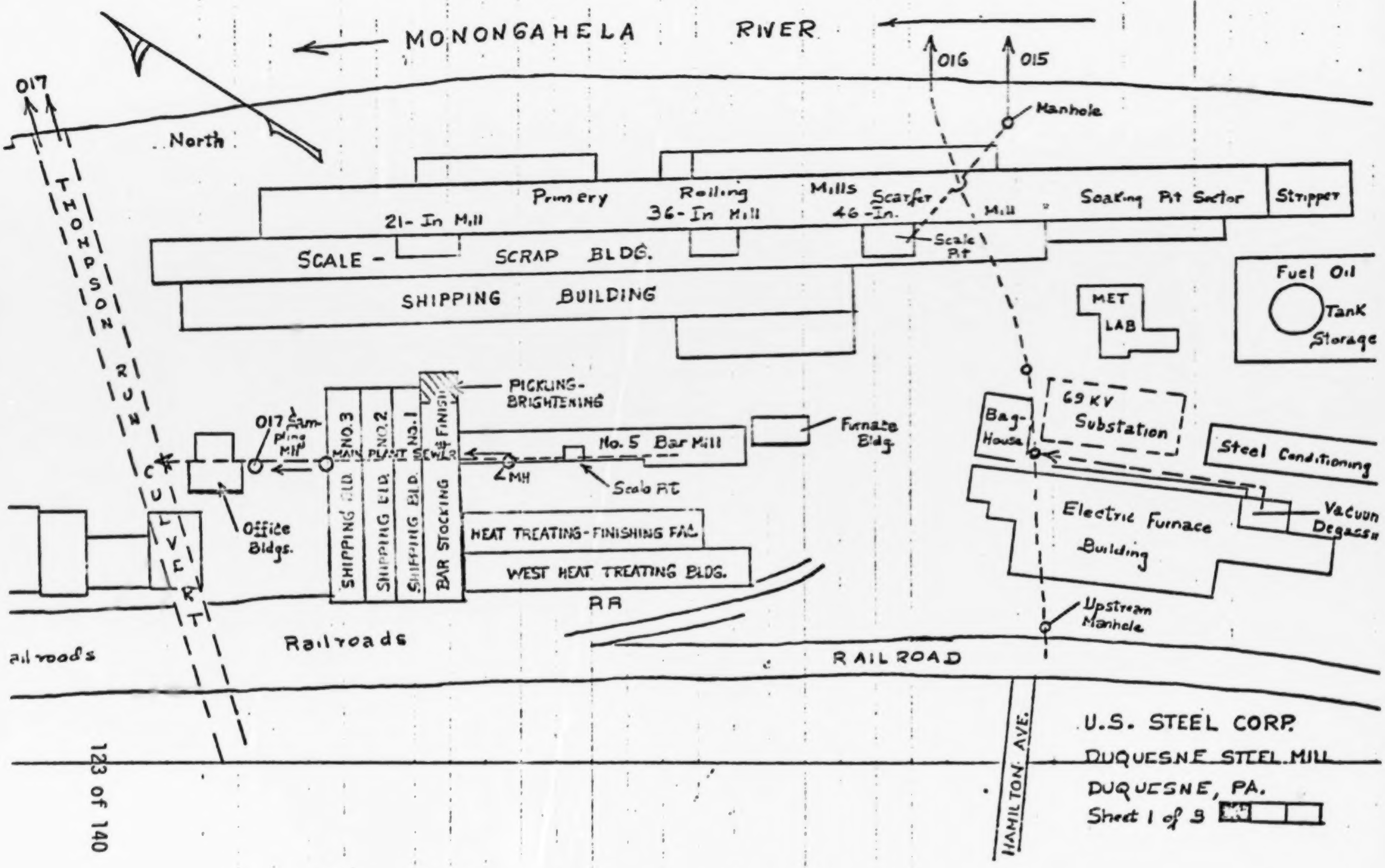
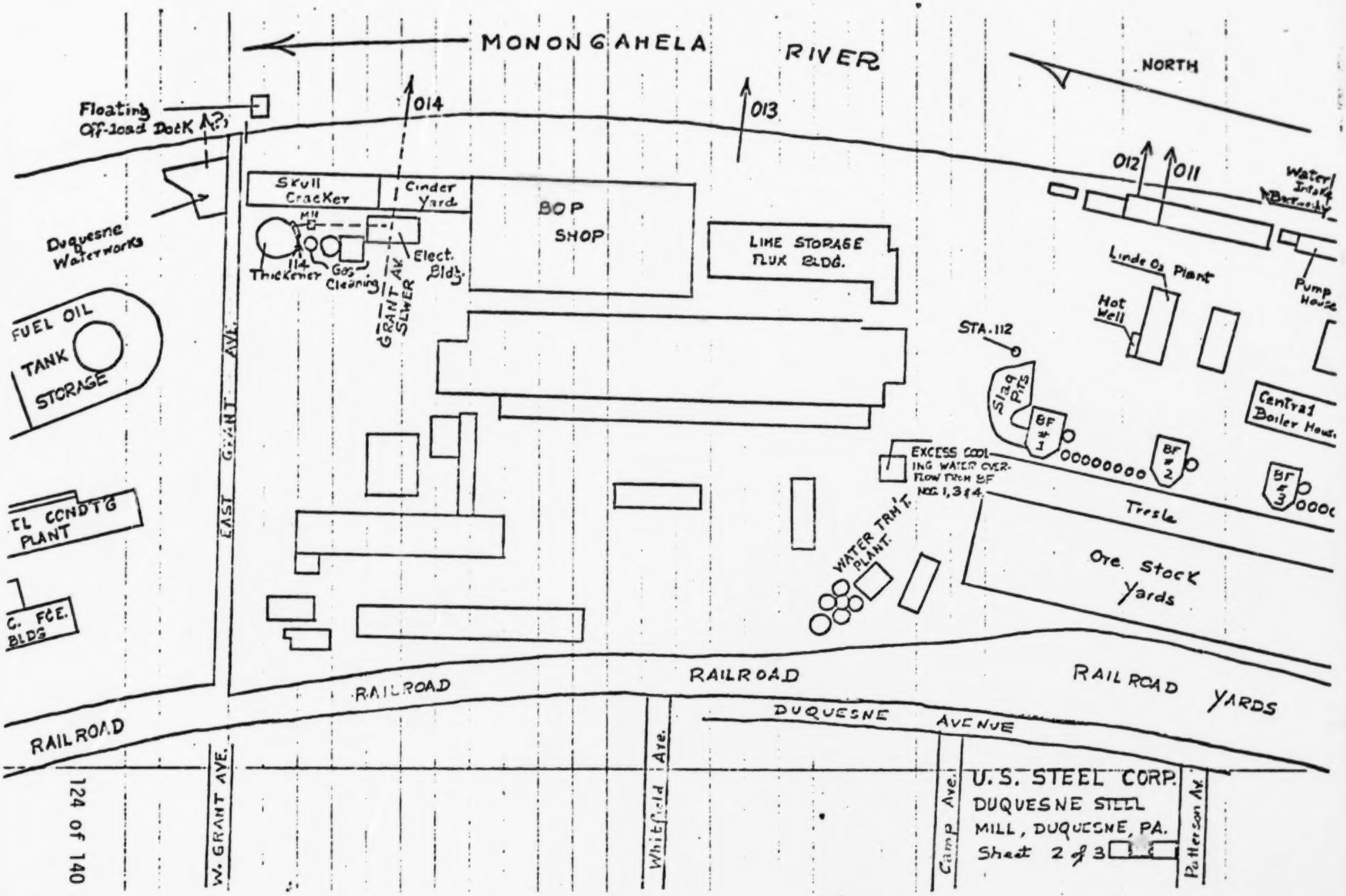
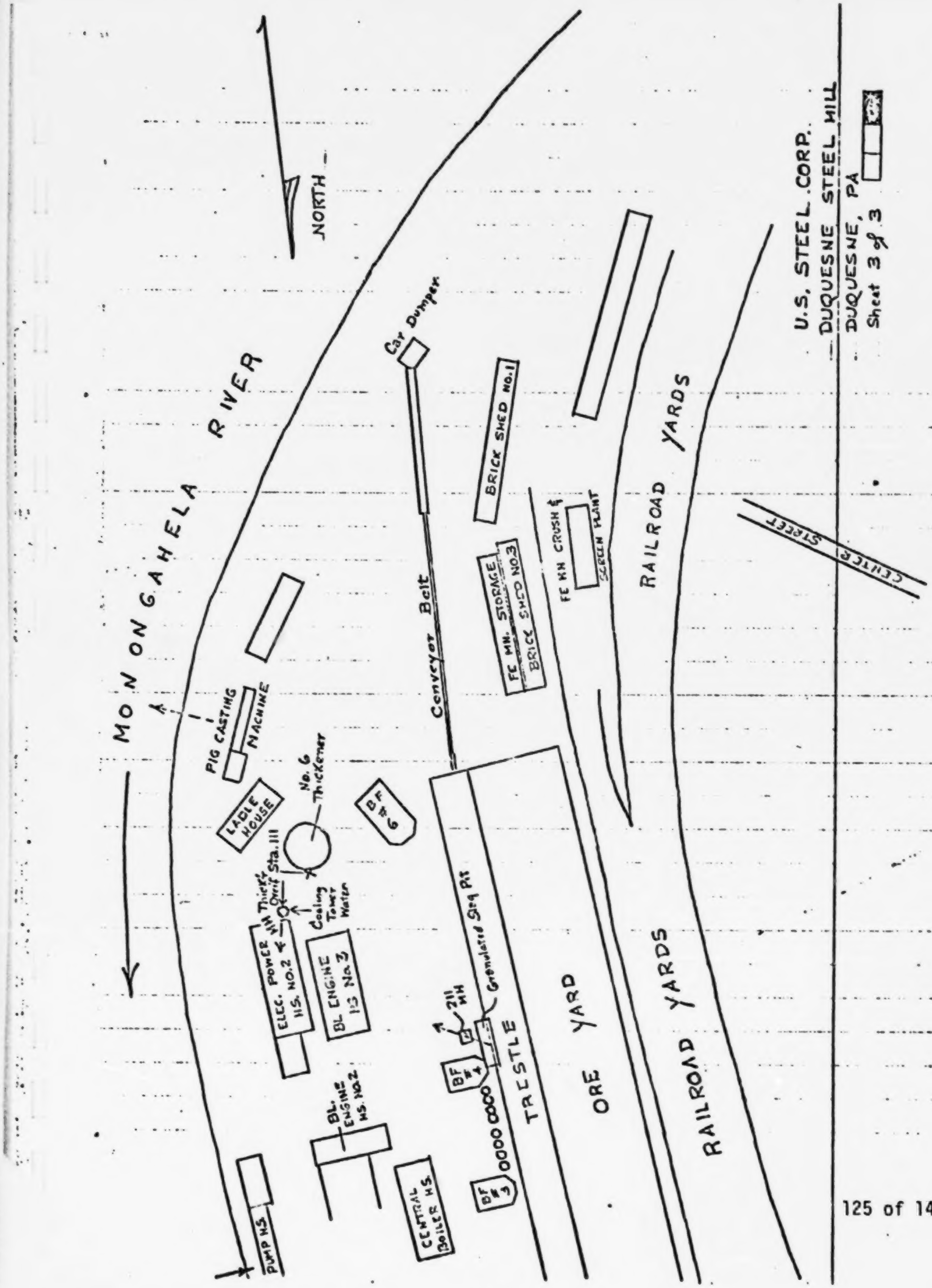
(2) This sampling point or outfall not affected by River stage during reasonably dry weather.


MONONGAHELA RIVER
017
North
016
015
Manhole
Primery Rolling Mills
21- In Mill
36-In Mill
46-In. Mill
Scarfer
Soaking Pit Sector
Stripper
Scale Pit
SCALE - SCRAP BLDG.
SHIPPING BUILDING
MET LAB
Fuel Oil Tank Storage
THOMPSON RUN
CULVERT
PICKLING-BRIGHTENING
017 Sampling MH
SHIPPING BLD. NO.3
SHIPPING BLD. NO.2
SHIPPING BLD. NO.1
BAR STOCKING
FINISH
MAIN PLANT SEWER
No. 5 Bar Mill
MH
Scale Pit
Furnace Bldg.
Office Bldgs.
HEAT TREATING-FINISHING FAC.
WEST HEAT TREATING BLDG.
RR
Railroads
ailroads
RAILROAD
Bag-House
69 KV Substation
Steel Conditioning
Electric Furnace Building
Vacuum Degasser
Upstream Manhole
HAMILTON AVE.

U.S. STEEL CORP.
DUQUESNE STEEL MILL
DUQUESNE, PA.
Sheet 1 of 3


MONONGAHELA RIVER
NORTH
Floating Off-load Dock A?
014
013
012
011
Water Intake Bar...
Duquesne Waterworks
Skull Cracker
Cinder Yard
BOP SHOP
LIME STORAGE FLUX BLDG.
Linde O2 Plant
Pump House
Hot Well
Thickener
M11
114
Gas Cleaning
GRANT AV. SEWER
Elect. Bldg.
FUEL OIL TANK STORAGE
STA. 112
Slag Pits
BF #1
BF #2
BF #3
Central Boiler Hous.
EXCESS COOLING WATER OVERFLOW FROM BF NOS. 1, 3 & 4.
Trestle
Ore Stock Yards
WATER TRM'T. PLANT
EAST GRANT AVE.
IL CONDTG PLANT
C. FCE. BLDG
RAILROAD
RAILROAD
RAILROAD
RAILROAD YARDS
DUQUESNE AVENUE
W. GRANT AVE.
Whitfield Ave.
Camp Ave.
Patterson Av.

U.S. STEEL CORP.
DUQUESNE STEEL
MILL, DUQUESNE, PA.
Sheet 2 of 3


U.S. STEEL CORP.
DUQUESNE STEEL MILL
DUQUESNE, PA
Sheet 3 of 3
NORTH
MONONGAHELA RIVER
Car Dumper
Conveyor Belt
BRICK SHED NO. 1
FE MN. STORAGE
BRICK SHED NO. 3
FE KN CRUSH &
SCREEN PLANT
RAILROAD YARDS
CENTER STREET
PIG CASTING MACHINE
LADLE HOUSE
No. 6 Thickener
BF #6
Sta. 111
Thick'r Over
MH
Cooling Tower Water
ELEC. POWER HS. NO. 2
BL ENGINE HS No. 3
211 MH
Granulated Slag Pit
BF #4
TRESTLE
ORE YARD
RAILROAD YARDS
BL. ENGINE HS. NO. 2
CENTRAL BOILER HS.
BF #3
PUMP HS.

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

July 24, 1974

CHAIN OF CUSTODY PROCEDURES

General:

The evidence gathering portion of a survey should be characterized by the minimum number of samples required to give a fair representation of the effluent or water body from which taken. To the extent possible, the quantity of samples and sample locations will be determined prior to the survey.

Chain of Custody procedures must be followed to maintain the documentation necessary to trace sample possession from the time taken until the evidence is introduced into court. A sample is in your "custody" if:

1. It is in your actual physical possession, or
2. It is in your view, after being in your physical possession, or
3. It was in your physical possession and then you locked it up in a manner so that no one could tamper with it.

All survey participants will receive a copy of the survey study plan and will be knowledgeable of its contents prior to the survey. A pre-survey briefing will be held to re-appraise all participants of the survey objectives, sample locations and Chain of Custody procedures. After all Chain of Custody samples are collected, a de-briefing will be held in the field to determine adherence to Chain of Custody procedures and whether additional evidence type samples are required.

Sample Collection:

1. To the maximum extent achievable, as few people as possible should handle the sample.
2. Stream and effluent samples shall be obtained, using standard field sampling techniques.
3. Sample tags (Exhibit I) shall be securely attached to the sample container at the time the complete sample is collected and shall contain, at a minimum, the following information: station number, station location, date taken, time taken, type of sample, sequence number (first sample of the day - sequence No. 1, second sample - sequence No. 2, etc.), analyses required and samplers. The tags must be legibly filled out in ballpoint (waterproof ink).

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Chain of Custody Procedures (Continued)

Sample Collection (Continued)

4. Blank samples shall also be taken with preservatives which will be analyzed by the laboratory to exclude the possibility of container or preservative contamination.

5. A pre-printed, bound Field Data Record logbook shall be maintained to record field measurements and other pertinent information necessary to refresh the sampler's memory in the event he later takes the stand to testify regarding his action's during the evidence gathering activity. A separate set of field notebooks shall be maintained for each survey and stored in a safe place where they could be protected and accounted for at all times. Standard formats (Exhibits II and III) have been established to minimize field entries and include the date, time, survey, type of samples taken, volume of each sample, type of analysis, sample numbers, preservatives, sample location and field measurements such as temperature, conductivity, DO, pH, flow and any other pertinent information or observations. The entries shall be signed by the field sampler. The preparation and conservation of the field logbooks during the survey will be the responsibility of the survey coordinator. Once the survey is complete, field logs will be retained by the survey coordinator, or his designated representative, as a part of the permanent record.

6. The field sampler is responsible for the care and custody of the samples collected until properly dispatched to the receiving laboratory or turned over to an assigned custodian. He must assure that each container is in his physical possession or in his view at all times, or locked in such a place and manner that no one can tamper with it.

7. Colored slides or photographs should be taken which would visually show the outfall sample location and any water pollution to substantiate any conclusions of the investigation. Written documentation on the back of the photo should include the signature of the photographer, time, date and site location. Photographs of this nature, which may be used as evidence, shall also be handled recognizing Chain of Custody procedures to prevent alteration.

Transfer of Custody and Shipment:

1. Samples will be accompanied by a Chain of Custody Record which includes the name of the survey, samplers signatures, station number, station location, date, time, type of sample, sequence number, number of containers and analyses required (Fig. IV). When turning over the possession of samples, the transferor and transferee will sign, date and time the sheet. This record sheet

allows transfer of custody of a group of samples in the field, to the mobile laboratory or when samples are dispatched to the NFIC - Denver laboratory. When transferring a portion of the samples identified on the sheet to the field mobile laboratory, the individual samples must be noted in the column with the signature of the person relinquishing the samples. The field laboratory person receiving the samples will acknowledge receipt by signing in the appropriate column.

2. The field custodian or field sampler, if a custodian has not been assigned, will have the responsibility of properly packaging and dispatching samples to the proper laboratory for analysis. The "Dispatch" portion of the Chain of Custody Record shall be properly filled out, dated, and signed.

3. Samples will be properly packed in shipment containers such as ice chests, to avoid breakage. The shipping containers will be padlocked for shipment to the receiving laboratory.

4. All packages will be accompanied by the Chain of Custody Record showing identification of the contents. The original will accompany the shipment, and a copy will be retained by the survey coordinator.

5. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government Bill of Lading should be obtained. Receipts from post offices and bills of lading will be retained as part of the permanent Chain of Custody documentation.

6. If samples are delivered to the laboratory when appropriate personnel are not there to receive them, the samples must be locked in a designated area within the laboratory in a manner so that no one can tamper with them. The same person must then return to the laboratory and unlock the samples and deliver custody to the appropriate custodian.

Laboratory Custody Procedures:

1. The laboratory shall designate a "sample custodian." An alternate will be designated in his absence. In addition, the laboratory shall set aside a "sample storage security area." This should be a clean, dry, isolated room which can be securely locked from the outside.

2. All samples should be handled by the minimum possible number of persons.

3. All incoming samples shall be received only by the custodian, who will indicate receipt by signing the Chain of Custody Record Sheet

accompanying the samples and retaining the sheet as permanent records. Couriers picking up samples at the airport, post office, etc. shall sign jointly with the laboratory custodian.

4. Immediately upon receipt, the custodian will place the sample in the sample room, which will be locked at all times except when samples are removed or replaced by the custodian. To the maximum extent possible, only the custodian should be permitted in the sample room.

5. The custodian shall ensure that heat-sensitive or light-sensitive samples, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained.

6. Only the custodian will distribute samples to personnel who are to perform tests.

7. The analyst will record in his laboratory notebook or analytical worksheet, identifying information describing the sample, the procedures performed and the results of the testing. The notes shall be dated and indicate who performed the tests. The notes shall be retained as a permanent record in the laboratory and should note any abnormalities which occurred during the testing procedure. In the event that the person who performed the tests is not available as a witness at time of trial, the government may be able to introduce the notes in evidence under the Federal Business Records Act.

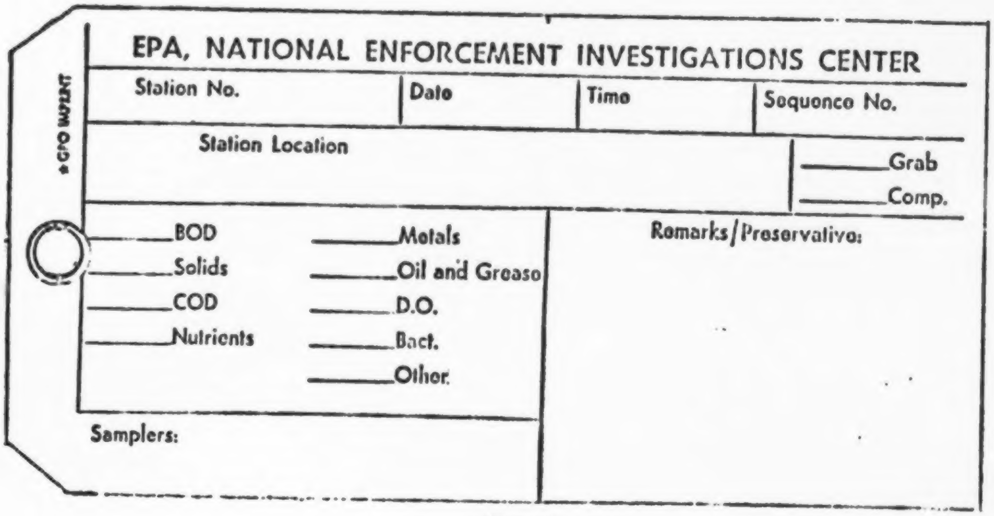
8. Standard methods of laboratory analyses shall be used as described in the "Guidelines Establishing Test Procedures for Analysis of Pollutants," 38 F.R. 28758, October 16, 1973. If laboratory personnel deviate from standard procedures, they should be prepared to justify their decision during cross-examination.

9. Laboratory personnel are responsible for the care and custody of the sample once it is handed over to them and should be prepared to testify that the sample was in their possession and view or secured in the laboratory at all times from the moment it was received from the custodian until the tests were run.

10. Once the sample testing is completed, the unused portion of the sample together with all identifying tags and laboratory records, should be returned to the custodian. The returned tagged sample will be retained in the sample room until it is required for trial. Strip charts and other documentation of work will also be turned over to the custodian.

11. Samples, tags and laboratory records of tests may be destroyed only upon the order of the laboratory director, who will first confer with the Chief, Enforcement Specialist Office, to make certain that the information is no longer required or the samples have deteriorated.

EXHIBIT I



EPA, NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

Station No.	Date	Time	Sequence No.

Station Location

_____ Grab
_____ Comp.

_____ BOD
_____ Solids
_____ COD
_____ Nutrients

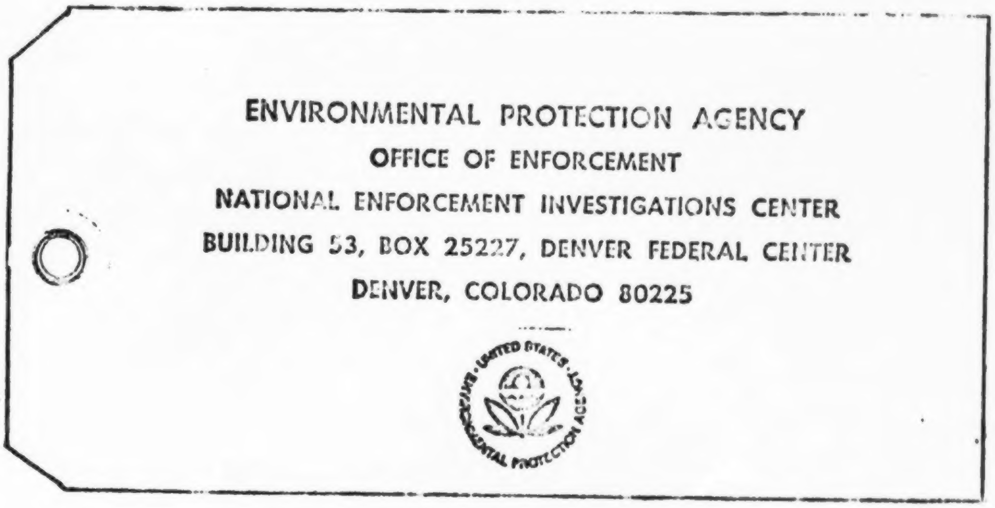
_____ Metals
_____ Oil and Grease
_____ D.O.
_____ Bact.
_____ Other

Remarks/Preservative:

Samplers:

☆GPO [illegible]

Front



ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Back

EXHIBIT II

FOR ______________________ SURVEY, PHASE______, DATE ______________

TYPE OF SAMPLE______________________

STATION NUMBER	STATION DESCRIPTION	TOTAL VOLUME	TYPE CONTAINER	PRESERVATIVE	ANALYSES REQUIRED																					
					NUTRIENTS	BOD	COD	TOC	TOTAL SOLIDS	SUSPENDED SOLIDS	ALKALINITY	DO	pH*	CONDUCTIVITY*	TEMPERATURE*	TOTAL COLIFORM	FECAL COLIFORM	TURBIDITY	OIL AND GREASE	METALS	BACTI	PESTICIDES	HERB	TRACE ORGANICS	PHENOL	CYANIDE

REMARKS

EXHIBIT III

Samplers: ____________________

____

____

____

FIELD DATA RECORD

STATION	NUMBER	DATE	TIME	TEMPERATURE °C	CONDUCTIVITY µmhos/cm	pH S.U.	D.O. mg/l	Gage Ht. or Flow Ft. or CFS

EXHIBIT IV

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

CHAIN OF CUSTODY RECORD

SURVEY	SAMPLERS: *(Signature)*

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE			SEQ. NO.	NO. OF CONTAINERS	ANALYSIS REQUIRED
				Water		Air			
				Comp.	Grab				

Relinquished by: *(Signature)*		Received by: *(Signature)*	Date/Tim
Relinquished by: *(Signature)*		Received by: *(Signature)*	Date/Tim
Relinquished by: *(Signature)*		Received by: *(Signature)*	Date/Tim
Relinquished by: *(Signature)*		Received by Mobile Laboratory for field analysis: *(Signature)*	Date/Tim
Dispatched by: *(Signature)*	Date/Time	Received for Laboratory by:	Date/Tim
Method of Shipment:			

Distribution: Orig. – Accompany Shipment
1 Copy – Survey Coordinator Field Files

GPO 854-

DYE DILUTION TECHNIQUE FOR FLOW MEASUREMENT

Flow determinations were made using dye dilution with fluorometric detection technique. In this procedure, a dye of known concentration is injected at constant rate upstream of the sample site, an adequate distance to insure mixing. Samples are collected and the dye concentration is determined by a fluorometer. Knowing the dye injection rate, initial dye concentration, and concentration after the dye has mixed with the wastewater flow, the flow can be calculated.

The G. K. Turner Model III fluorometer was used. Calibration of the fluorometer was accomplished daily using dye standards prepared in the NEIC laboratory. Rhodamine WT dye was used due to its low sorptive tendency and stability under varying pH conditions.

Background investigations of all stations were conducted to determine if any substances in the waste stream would fluoresce in the range that could induce errors in flow determinations. Background samples were taken each time samples for flow determination were collected. The fluorescence measured on background samples was subtracted from the fluorescence measured on the flow samples.

Special precautions taken to insure against interference in flow measurements consisted of: 1) cuvettes triple rinsed with distilled water between each sample; 2) cuvettes cleaned daily with solvent; 3) cuvettes filled with distilled water and fluorescence measured twice daily to insure against contamination from operator handling; 4) fluorometer checked for "0" reference between each reading and after use, using "0" reference blank; 5) all readings were taken on upward movement of indicator to eliminate any error due to gear "slop;" and 6) rubber gloves were worn when handling raw dye to avoid contamination during fluorometer operation.

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ANALYTICAL PROCEDURES AND QUALITY CONTROL

Samples collected during this survey were analyzed, where appropriate, according to procedures approved by EPA for the monitoring of industrial effluents.* The analytical procedures for characterizing trace organic chemical pollutants are described below. The remaining procedures are listed in the following table.

Parameter	Method	Reference
Al, Cr, Fe, Pb, Sn, Zn, Cu	Atomic absorption	EPA Methods for Chemical Analyses of Water and Wastewater, 1971, p 83
TSS	Gravimetric	ibid., p 278
Cyanide	Distillation, colorimetric	ibid., page 41
Phenol	Automated colorimetric	EPA Methods for Chemical Analyses of Water and Wastes, 1974, p 243
Ammonia	Automated phenate	ibid., page 168
Oil and grease	Freon extraction	Standard Methods, 13th Ed., p 254
BOD	Serial dilution (Winkler-Azide)	ibid., page 489
Hexavalent chromium	Colorimetric	ibid., page 429

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* *Federal Register, Vol. 40, No. 111, June 9, 1975*

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Samples for organic chemical pollutant analysis were collected in clean, solvent-rinsed one-gallon glass containers. These samples were air-freighted to Denver and extracted with methylene chloride. The extract was dried with anhydrous sodium sulfate, concentrated, exchanged into acetone and analyzed by hydrogen flame ionization gas chromatography. Those samples that showed adequate response were set aside for characterization by combined gas chromatography-mass spectrometry (GC/MS). The GC/MS analyses were carried out with a Finnigan Model 1015 Quadropole Mass Spectrometer and a Systems Industries Model 150 computerized data system. Mass spectra were compared to data files in the NIH Computer System and also to listing in the *Eight Peak Index of Mass Spectra*, Second Edition, 1974, compiled by the Mass Spectrometry Data Center. All identifications are considered preliminary until authentic standards of the suspected chemical compounds can be obtained and analyzed under similar conditions to match the mass spectrum and gas chromatographic retention time. This procedure does not detect highly volatile organic chemical pollutants since their presence is masked by the extraction solvent.

Reliability of the analytical results was documented through an active Analytical Quality Control Program. As part of this program, replicate analyses were normally performed with every tenth sample to ascertain the reproducibility of the results. In addition, where appropriate, every tenth sample was spiked with a known amount of the constituents to be measured and reanalyzed to determine the percent recovery. These results were evaluated in regard to past AQC data on the precision, accuracy and detection limits of each test. On the basis of these findings, all analytical results reported for the survey were found to be acceptable with respect to the precision and accuracy control of this laboratory.